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The TIMBER RESOURCES of VERMONT



U. S. FOREST SERVICE RESOURCE BULLETIN NE-12
1968

NORTHEASTERN FOREST EXPERIMENT STATION, UPPER DARBY, PA.
FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE
RICHARD D. LANE, DIRECTOR

FOREWORD

UNDER the authority of the McSweeney-McNary Forest Research Act of May 22, 1928, and subsequent amendments, the Forest Service, U. S. Department of Agriculture, conducts a series of continuing forest surveys of all states to provide up-to-date information about the forest resources of the Nation.

A resurvey of the timber resources in Vermont was made in 1965 and 1966 by the Northeastern Forest Experiment Station, approximately 18 years after the initial forest survey.

In this resurvey, as in the initial survey, the Northeastern Station received cooperation from the Vermont Department of Forests and Parks. The Department purchased the aerial photographs of the entire state that were used for the resurvey and gathered information on the output of timber products. State field crews remeasured initial forest survey plots and established new plots on all State forest land.

Personnel of the Green Mountain National Forest carried out the part of the survey on National forest land.

This report summarizes the timber-resource situation and the changes that have taken place since the initial survey. Trends in the supply of timber for forest-based industries are pointed out and projections of future timber supply are made.

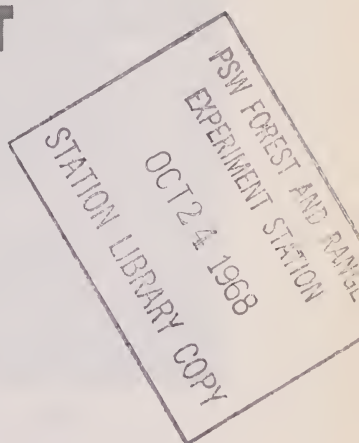
In this resurvey, a portion of the initial ground plots was remeasured to provide estimates of net annual timber growth and estimates of land-use change and to update the initial forest inventory volume. New ground plots were established for an independent second estimate. These two sets of estimates were weighted and combined to give the current estimates of forest area and timber volume.

Sampling errors, which indicate reliability, are shown for most of the totals of the breakdowns of the new estimates. Users of these resource data are cautioned to read carefully the definitions of terms and the section pertaining to the reliability of the estimates in the appendix.

COVER PHOTO: Vermont's State Capitol at Montpelier set against a forest background.

The TIMBER RESOURCES of VERMONT

by **Neal P. Kingsley**
and **Joseph E. Barnard**



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One of many pleasant vistas to be found in Vermont.

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Important Findings

MANY significant changes in the timber resource of Vermont have taken place since the first Forest Survey report of Vermont was published in 1948. Here briefly are some of the more important findings of the second survey—

- Commercial forest land totaled 4,295 thousand acres—73 percent of Vermont's total land area. This is an increase of 16 percent since 1948.
- Nearly 91 percent of Vermont's commercial forest land is privately owned. Forest industries own 16 percent; farmers, 32 percent; and miscellaneous private owners, 43 percent.
- The area in softwood forest types increased one-third while the area of hardwood types increased slightly. Softwood types cover 1,349 thousand acres and hardwood types cover 2,946 thousand acres.
- Sixty-seven percent of the commercial forest land is well stocked with growing-stock trees. But, only a very small proportion is well stocked with desirable trees.
- The volume of growing stock totaled 3,765 million cubic feet—up 12 percent from 1948.
- Despite an increase in total forest land area, the volume of sawtimber declined from 7.6 billion board feet in 1948 to 6.6 billion in 1966.
- Less than 40 percent of the sawtimber volume is in trees 15.0 inches d.b.h. and larger.
- Average net annual growth of growing stock was 83 million cubic feet and average annual timber cut was 61.2 million cubic feet for the 18 years between surveys.

- Average net annual growth of sawtimber was 174.7 million board feet and average annual sawtimber cut was 225.8 million board feet for the 18 years between surveys.
- The future supply of timber in Vermont looks favorable, but quality timber will continue to be scarce.
- For Vermont to realize the full potential from its timber resource, an extensive program of timber-stand improvement will be needed.

Farming vs. Lumber

Settlement and Farming

When the first settlers came to Vermont, more than 2 centuries ago, over 95 percent of the land was forested. As settlement advanced and available land became scarcer, the settlers established their self-sufficient farms on forested mountainsides.

Because these farms were literally cut out of the woods, the forest was more foe than friend. Once the land was cleared, the farmers made only moderate demands on the forest, chiefly for firewood, potash, and building material for homes and farm buildings.

This type of land-clearing continued in Vermont for over a century. By 1870 Vermont's forests had been reduced to an all-time low: sixty-eight percent of the State's land area was being used for agriculture.¹ More land had been cleared in Vermont in 150 years than had been cleared in either New Hampshire or Maine.

In the late nineteenth century, farms were abandoned in increasing numbers, particularly the hill farms, and the population shifted to urban areas and to the Western States. The reasons for this exodus from the farms are many and complex. Rural people came to demand the goods and services that could be had only in the urban areas. Young people sought, and often found, more lucrative employment in the manufacturing centers of

¹ Wilson, H. Q., THE HILL COUNTRY OF NORTHERN NEW ENGLAND. 100 pp. Columbia University Press, New York. 1936.



Only the better Vermont farms were able to survive the decline of agriculture.

southern New England and New York. The hillside farms, which were on land not well suited to agriculture, became depleted and more difficult to farm. Added to this, cheaper foodstuffs from the agriculturally rich Midwest found increasingly favorable markets in Boston and other southern New England cities. All of these factors came together to force the ever-increasing, although often reluctant, abandonment of these farms.

For a time, cattle and sheep raising provided a new source of revenue. Vermont became famous for its Merino sheep, which had been imported from Spain. However, even these attempts to continue farming failed because meat and wool produced in Vermont could not compete with the cheaper meat and wool from the West.

Between 1880 and 1966—86 years—approximately 1.7 million acres of farm land reverted to forest land. Farming in Vermont did not decline at a constant rate during those 86 years. During the depression of the 1930's and then during World War II

agriculture had a slight but short-lived revival. This was spurred first by a return to family farms by the unemployed and then by the war.

The Forest Industries

When the earliest settlers arrived in Vermont their main concern was to clear the forests to make room for cabins and farms. However, later settlers looked upon the forests as a source of livelihood, and the lumber industry in Vermont began. The word *lumber* originally meant accumulated stores of cumbrous and discarded household articles. In Vermont the word lumber was to come to mean a mainstay of the State's economy.

Burlington, which is advantageously situated on Lake Champlain, became the center of a bustling lumber industry. At first, rafts of white pine and oak were floated north to Quebec for shipment to Europe. By 1835 the supply of accessible raw material was exhausted. But extension of the railroad and completion of the canal system from the Ottawa River to Albany in the late 1840's opened new sources of supply as well as markets for lumber. By 1880 Burlington was the third largest producer of lumber in the United States. Huge quantities of lumber were produced and distributed throughout the world. Across the state, the Connecticut River was used to transport logs and lumber to the mills and markets of Massachusetts.

In 1889 Vermont reached its peak in lumber production by producing 430 million board feet. By 1920 lumber production had sunk to 200 million board feet. It did not rise above 200 million again until 1946, but then it reverted to its earlier downward slide until by 1965 lumber production had dropped to 115 million board feet.

Vermont's forests also provided spruce and fir pulpwood for the woodpulp industry that developed in the late 1800's. Bellows Falls became the center of a thriving paper industry and, to this day, still manufactures many types of specialty grade papers. Although Vermont today has only one active woodpulp mill, the 113 thousand cords of pulpwood cut in Vermont in 1965 were used by woodpulp mills in Vermont, New York, New Hampshire, and Canada.

Forest Area

Seventy-three percent of Vermont's land area today is commercial forest land²—a total of 4,295 acres. Of Vermont's 13 counties³ that have commercial forest land none is less than 50 percent forested, and only three are less than 70 percent forested. Essex County, in the far northeastern corner of the State, is the most heavily forested; over 92 percent of its area is in commercial forest land. The least forested county is Franklin County, which is 50 percent covered by commercial forest. This county lies in the northwestern portion of the State in the fertile Champlain Valley.

In addition to the 4.3 million acres of commercial forest land in Vermont, there are 27 thousand acres of noncommercial forest land. Twenty thousand acres of this land are unproductive forest

² See appendix for definitions of this and other terms used in this report.

³ Grand Isle County has been excluded from this timber inventory. Although the county contains approximately 10 thousand acres of forest land and does furnish some timber products, it was excluded because we felt that the recreation potential of the county's forest land far outweighed its potential for timber production.



Percent of the total land area of Vermont counties that is commercial forest land.

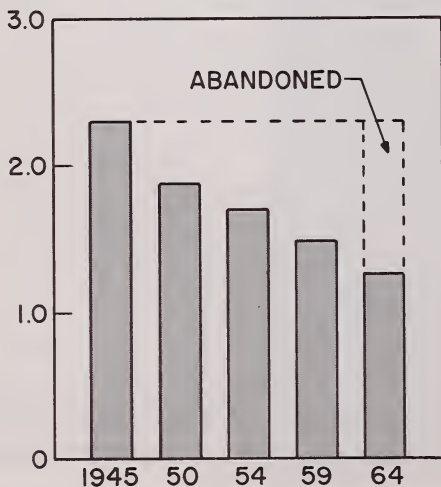
land. This land is not capable of yielding forest products because site conditions are adverse. The remaining 7,000 acres of non-commercial forest land is productive land that has been withdrawn from timber production through ordinance, statute, or administrative order. Typical of these areas are state parks and other recreation sites.

Changes in Commercial Forest Land Area

The area of commercial forest land in Vermont has increased by over $\frac{1}{2}$ million acres since 1948. In 1948 the commercial forest land area of the State totaled 3,713,400 acres; by 1966 it totaled 4,294,600 acres. Undoubtedly the overriding cause of this increase in forest land was the rapid decline of farming during this period. According to the Census of Agriculture,⁴ cropland and treeless pasture land in Vermont decreased by nearly 45 percent between 1945 and 1964.

⁴ U. S. Department of Commerce. United States Census of Agriculture 1(3): 7. 1964.

MILLION
ACRES



Cropland and treeless pasture land in Vermont decreased by almost 45 percent between 1945 & 1964.

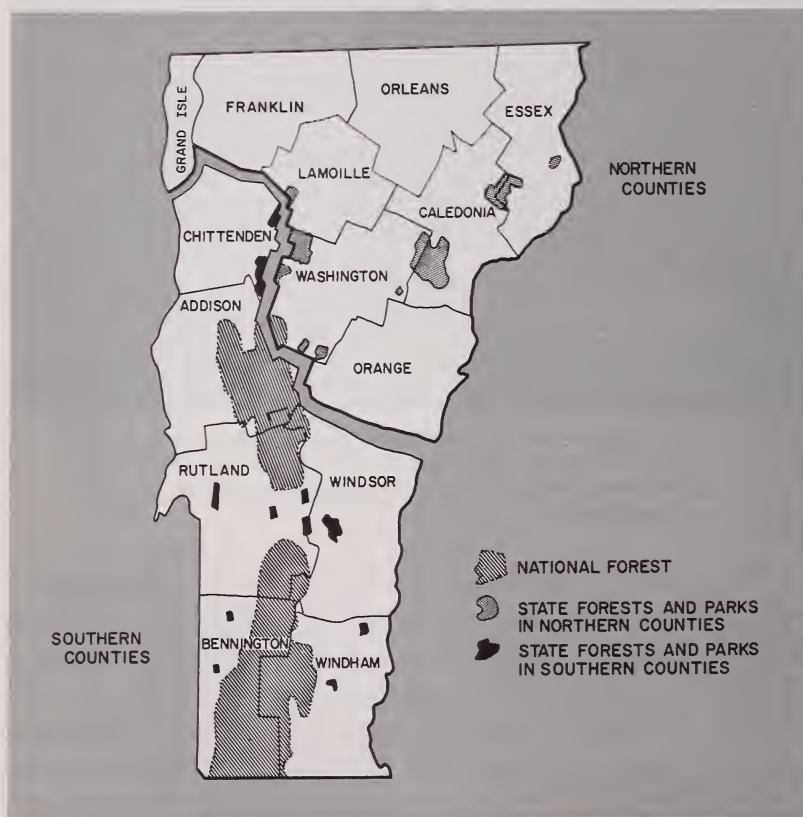


The east boundary of the Lyndon State Forest—(A) 1910 and (B) 1966. A dramatic illustration of the results of reforestation. Photo credit: Vermont Department of Forests and Parks.

The increase in commercial forest land was distributed generally throughout the State. Every county registered a significant increase. However, Orleans County showed the most outstanding increase—a gain of nearly a third in commercial forest area. Of the five geographic sampling units, the Northern Counties unit gained 18 percent in forest area. The Southern Counties unit was close behind with a 14-percent increase. Acreage of commercial forest land and the percent of change in the five geographic units are:

<i>Geographic unit</i>	<i>1948 (thousand acres)</i>	<i>1966 (thousand acres)</i>	<i>Change (per cent)</i>
National forest	190.8	219.9	+15
Northern counties*	1,755.8	2,072.1	+18
Southern counties	1,681.2	1,919.3	+14
State forests and parks in the northern counties	54.8	59.5	+ 9
State forests and parks in the southern counties	21.4	23.8	+11
All units	3,704.0	4,294.6	+16

* Excluding Grand Isle County.



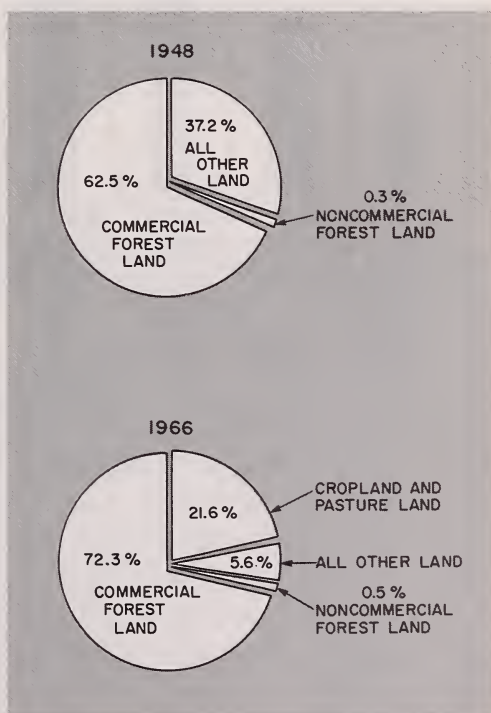
Geographic sampling units used for the resurvey of Vermont.

Farmers No Longer Own Most Forest Land

In 1948 farmers owned 48 percent of Vermont's commercial forest land. By 1966 commercial forest land owned by farmers had dropped to 32 percent—1,352,000 acres.

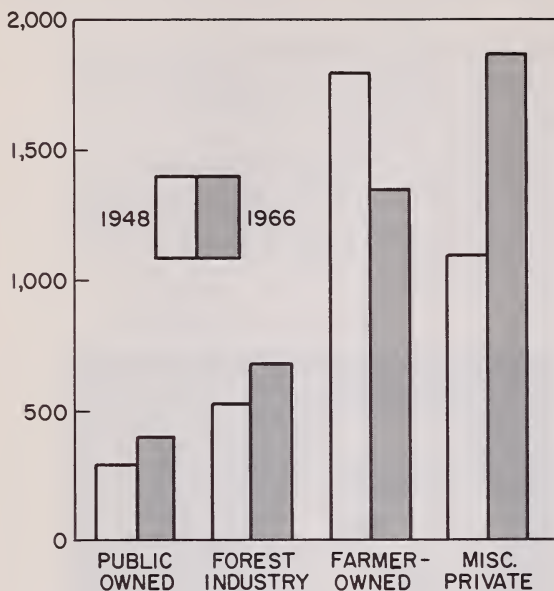
Today the most important group of forest owners are those classified as miscellaneous private owners. These are generally people whose livelihood is not connected with the forest or farm-

Land use has changed substantially since 1948.



ing. They may be business and professional people, housewives, teachers, and the like. This group owns 43 percent of the commercial forest land in the State—a total of 1,866,000 acres. By comparison, miscellaneous private owners owned 1,087,000 acres or 29 percent of the commercial forest land in 1948.

THOUSAND
ACRES



All classes of ownership increased in area except farmer-owned, which dropped by 548 thousand acres.

Although the acreage owned by forest-based industries increased by 150,000 acres from 1948 to 1966, the share of commercial forest land owned by these industries gained less than 2 percent—from little more than 14 percent to almost 16 percent. The largest share of the forest-industry land is owned by pulp and paper companies—a total of 317,000 acres. Lumber companies own 279,000 acres, and other forest industries own 82,000 acres.

Only 9 percent of the commercial forest land is publicly owned. In 1948 this ownership group held 8 percent. The largest public ownership—220,000 acres—is the Green Mountain National Forest. In addition to this the Federal Government also owns another 4,000 acres in Vermont. The State of Vermont owns 131,000 acres of commercial forest in state parks, state forests, and other holdings. The counties and the municipalities own 44,000 acres of commercial forest.

Softwood Types Gain More Area Than Hardwood Types

The increase in commercial forest land between forest surveys was not evenly distributed among the forest types. The area in softwood types increased by nearly one-third, while the area of hardwood types gained not quite one-tenth. Softwood types cover 1,349,000 acres—31 percent of the forest area. By comparison, softwood types occupied 1,044,600 acres—28 percent of the forest area in 1948. Hardwood types cover 2,946,000 acres—69 percent of the forest area of the State. In 1948 hardwood types covered 2,668,800 acres.

A typical old-growth northern hardwood stand. Northern hardwood is the most common forest type in Vermont.





A typical spruce-fir stand. Spruce-fir is the most common softwood type in Vermont.

The spruce-fir type covers 749,000 acres (17 percent of the commercial forest area). This type is composed of spruce and/or the true firs, either as pure stands or associated with white-cedar, tamarack, maple, birch, and hemlock. In Vermont this type usually is found on moist sites in the northern portion of the State and at higher elevations in the southern portion.

The white pine-red pine type occupies 600,000 acres—14 percent of the commercial forest land. This type group includes pure stands of white pine, white pine mixed with hemlock or northern hardwood, and pure and mixed stands of red pine. The type commonly is scattered throughout the State on all soils from sea level to about 2,500 feet elevation.

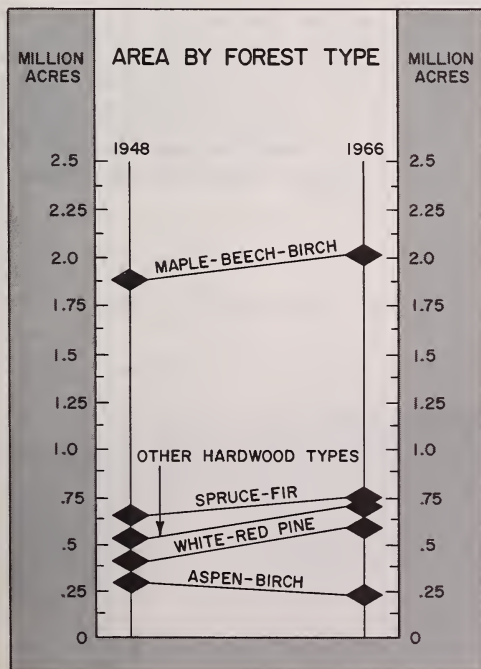
By far the most common and economically the most important forest type in Vermont is the maple-beech-birch or northern hardwood type. This type occupies 2,004,000 acres or nearly 47 percent of the State's total forest area. It is composed of stands in which maple, beech, or yellow birch together or separately com-

prise a plurality of the stocking. The sugar maple, symbolic of Vermont, is common in this type. Other species, like hemlock, white pine, basswood, and white birch, also are frequently found in this type. In general, the northern hardwoods prefer fertile and moist loamy soils. Occasionally they may be found on sandy soils.

An aesthetically and commercially important type group is the elm-ash-red maple type, which covers 555 thousand acres. This type, which frequently is found in wet areas, provides the red maple swamps and bottoms that are often bright red in the fall.

The aspen-birch type covers 249,000 acres. This type is found in scattered stands throughout Vermont, but is more common in the northern portion. Quite often this type is succeeded by the spruce-fir type.

The oak forest types are relatively unimportant in Vermont. The oak-hickory type occupies 75,000 acres and the oak-white pine type covers 63,000 acres. All of this area is in the southern portion of the State.



The increase in commercial forest land between forest surveys was not evenly distributed among the forest types.

The Area in Sapling-and-Seedling Stands Increased

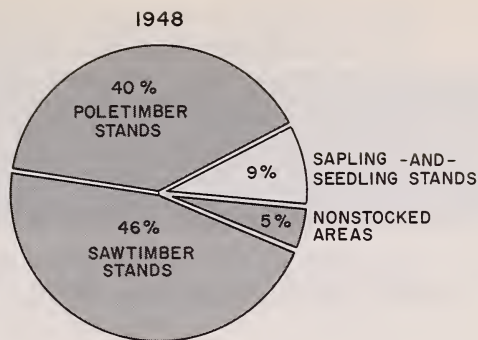
Although the area of sawtimber-size stands increased by 4 percent from 1948 to 1966, the percent of all commercial forest land occupied by sawtimber stands decreased from 46 percent of the area in 1948 to 41 percent in 1966.⁵ Similarly the area in poletimber stands increased by 2 percent, but as a percent of all stands they decreased from 40 percent in 1948 to 35 percent in 1966.

The area in sapling-and-seedling stands increased 645,000 acres. The area of nonstocked forest land decreased by 136,000 acres. This large increase in sapling-and-seedling stands is undoubtedly due to the rapid decrease in the number of farms during the late 1940's and 1950's. Many previously nonstocked areas are now in sapling-and-seedling stands and because the decline of farming has slowed, fewer forest areas now can be classified as nonstocked.

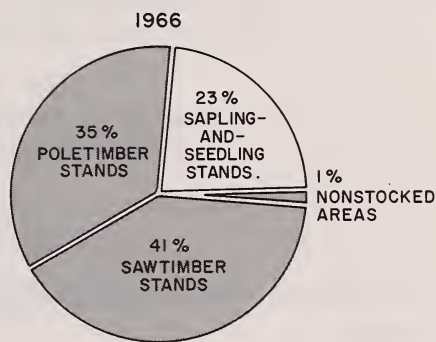
⁵ Because the method of determining stand-size class was changed between 1948 and 1966, the 1948 estimates of sawtimber and poletimber stands have been adjusted to the 1966 basis. Stand-size classes in the initial inventory (1948) were determined by volume specifications as well as by stocking (Sawtimber stands had a minimum of 1,500 net board feet per acre). In the second inventory (1966) stand sizes were determined by the plurality of stocking. If plurality of stocking had been used for the sawtimber classification on the initial survey, the area in sawtimber stands would have been approximately 5 percent less than that reported for 1948 (46 percent rather than 51 percent).

**With the decline of farming, much of Vermont's farm land
is reverting to forest.**





The area in sapling-and-seedling stands increased by 14 percent from 1948 to 1966.

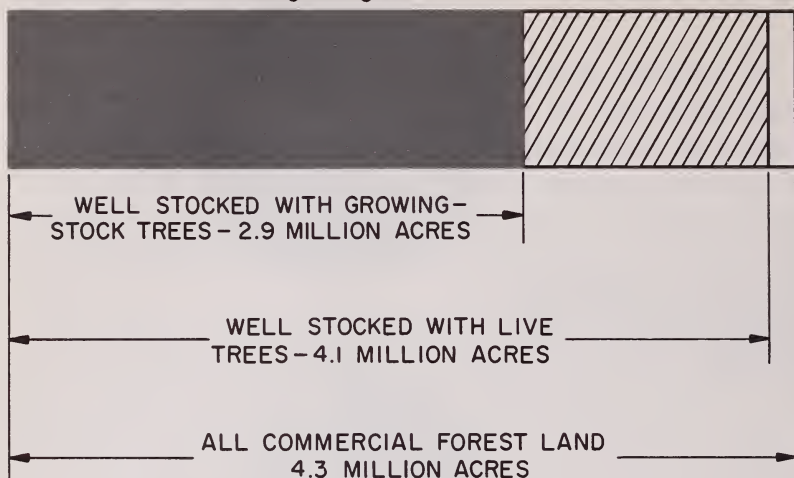


High Proportion of Forest Land Stocked With Low-Quality Trees

In Vermont a well-stocked acre of forest land is one that contains 42 square feet or more of basal area in trees 5 inches d.b.h. and larger.⁶ On this basis, if all live trees are considered, 96 percent—4.1 million acres—of the State's commercial forest land is well stocked. When rough and rotten trees are excluded and only growing-stock trees are considered, this percentage drops to 67 percent—2.9 million acres of commercial forest land. If one wishes to consider only desirable growing-stock trees (the type of trees forest managers aim to grow) only a very small propor-

⁶ Forty-two square feet of basal area is 70 percent of minimum full utilization of the site, which, in Vermont, has been set at 60 square feet of basal area in trees 5 inches d.b.h. and larger. Minimum full utilization has in turn been defined as the lowest stocking level at which the growing space is fully occupied.

Only two-thirds of Vermont's commercial forest land is well stocked with growing-stock trees.



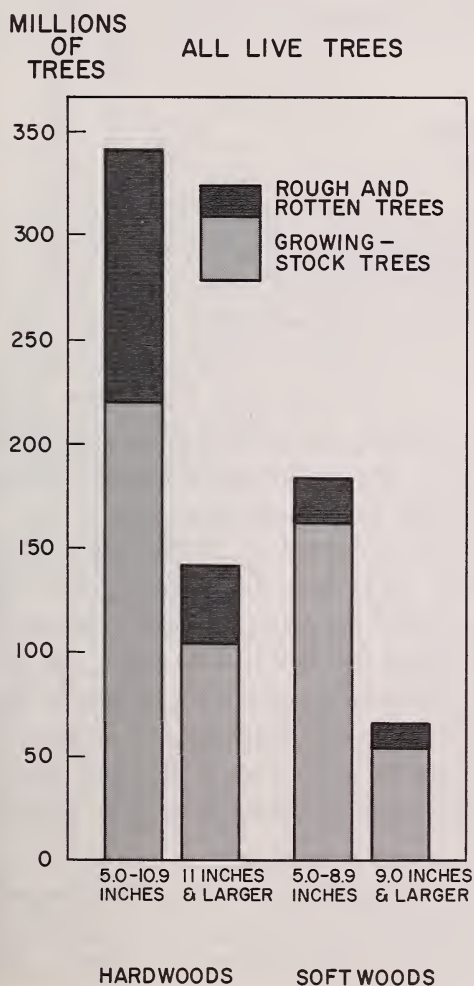
tion of Vermont's commercial forest land would be considered well stocked.

No data were compiled to show the area in softwood stands and in hardwood stands that is well stocked with growing-stock trees. However, a comparison gives an indication. On the basis of volume per acre, softwood sawtimber stands contain an average of approximately 1,500 cubic feet of growing-stock volume compared with about 1,000 cubic feet in hardwood sawtimber stands. Thus hardwood sawtimber stands contain about one-third less volume per acre than do softwood stands. For poletimber stands this comparison is about 1,400 to 800 cubic feet and for sapling-and-seedling stands 400 to 200 cubic feet. When all stand-size classes are taken together, all softwood stands average about 1,100 cubic feet per acre compared with an average of approximately 800 cubic feet per acre for hardwood stands. On the average then, hardwood stands contain about 27 percent less growing-stock volume than do softwood stands. From this comparison we can reasonably conclude that, proportionately, the area of well-stocked hardwood stands is less than the area of well-stocked softwood stands.

Timber Volume

Timber Volume Failed To Keep Pace with Increase in Forest Area

Although the area of commercial forest land increased 16 percent, the total volume of growing stock increased only 12 percent. Growing stock totaled 3,765 million cubic feet, compared



One tree in four is rough and/or rotten.

with 3,373 million cubic feet in 1948.⁷ The net cubic-foot volume of softwoods increased from 1,190 million in 1948 to 1,420 million in 1966, a gain of 19 percent. Hardwood net cubic-foot volume increased 162 million feet—only 7 percent—to 2,345 million in 1966.

In addition to the 3,765 million cubic feet of growing stock in Vermont's forests, there is also 306 million cubic feet of sound wood volume in rough trees and 161 million feet in rotten trees. Much of this material can be used by industries that depend primarily on wood for fiber. One tree in four—26 percent—is a rough or rotten tree. Rough and rotten trees make up 32 percent of all live hardwood trees and account for 13 percent of all live softwood trees.

Sugar Maple Has Largest Growing-Stock Volume

Hardwood species make up 62 percent of Vermont's growing-stock volume—2,345 million cubic feet. The maples account for 47 percent of this hardwood volume. Sugar maple has the greatest volume of all species—hardwood and softwood—with 829 million cubic feet. This volume is 35 percent of the hardwood growing stock and 22 percent of all growing stock. The species with the second highest volume is yellow birch; 299 million cubic feet—13 percent of the hardwood. Red maple has 276 million cubic feet of growing stock and ranks third in volume.

Softwood species account for 38 percent of Vermont's growing-stock volume—1,420 million cubic feet. The spruces have the highest volume of softwoods and the second highest volume of all species. The spruces account for 496 million cubic feet of growing stock—35 percent of the softwood and 13 percent of the volume of all species. The second-ranked softwood in volume is eastern hemlock with 316 million cubic feet of growing stock. This species also ranks third in volume among all species. Eastern

⁷ Because Forest Survey methods and definitions changed between 1948 and 1966, direct comparisons of volumes between surveys is not possible. Therefore, the 1948 estimates presented in this report have been adjusted to 1966 Forest Survey standards. A complete discussion of these differences is presented in the appendix.

MILLIONS
OF
TREES

GROWING - STOCK TREES
(1.0 INCH D.B.H. & LARGER)



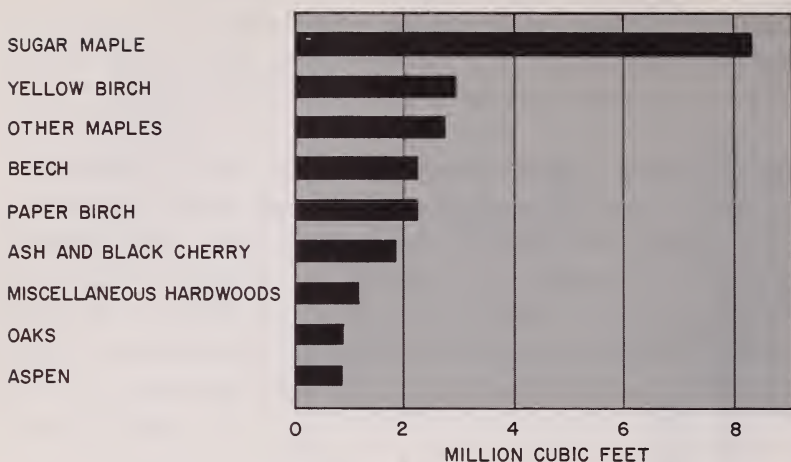
The number of hardwoods exceeds the number of softwoods in every diameter class.

white pine and red pine combined ranked third⁸ among the softwoods with 296 million cubic feet of growing stock.

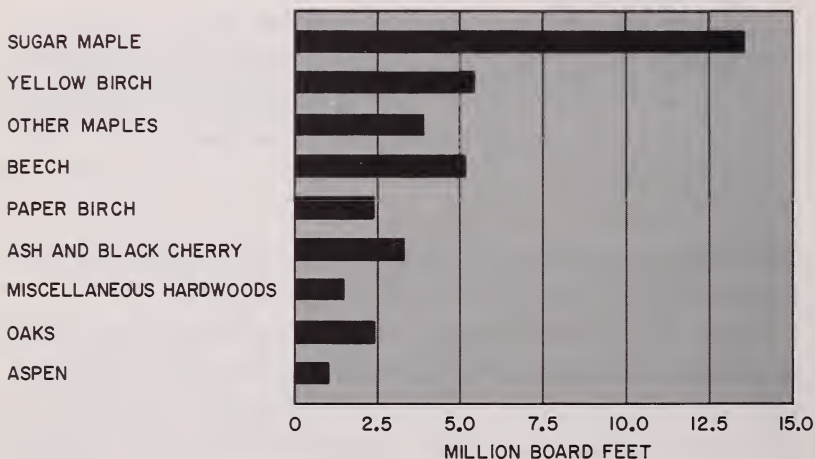
Several changes in the ranking of species by volume of growing stock occurred between 1948 and 1966. Sugar maple, the spruces, and red maple held their ranking in abundance from 1948 to 1966: first, second, and sixth, respectively. However, hemlock rose from fifth place in 1948 to third in 1966. White and red pines went from seventh place to fifth place. Yellow birch fell from third place in 1948 to fourth in 1966. The most outstanding change occurred in the volume of beech, which fell from fourth place in 1948 to eighth position in 1966. This sudden decline is undoubtedly due primarily to the outbreak of the beech scale disease in Vermont.

⁸ This total includes about 1 percent red pine.

HARDWOOD GROWING - STOCK VOLUME



HARDWOOD SAWTIMBER VOLUME

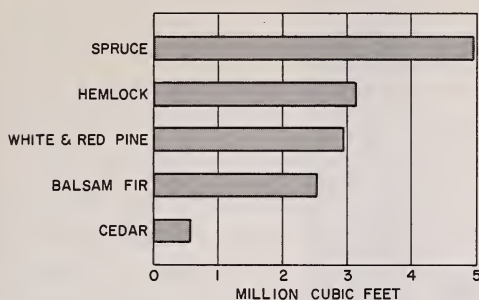


Hardwood volume by species.

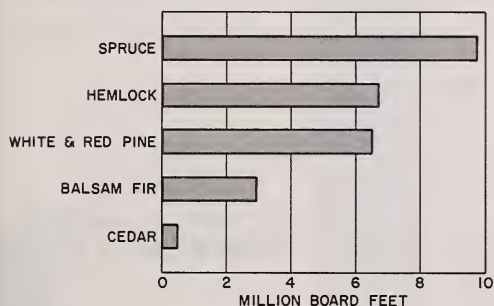
Sawtimber Volume Declines

The volume of sawtimber in Vermont declined 13 percent between 1948 and 1966. In 1948 sawtimber volume totaled 7.6 billion board feet, but by 1966 it had fallen to 6.6 billion feet. This change is the result of a substantial decline in softwood

SOFTWOOD GROWING-STOCK VOLUME



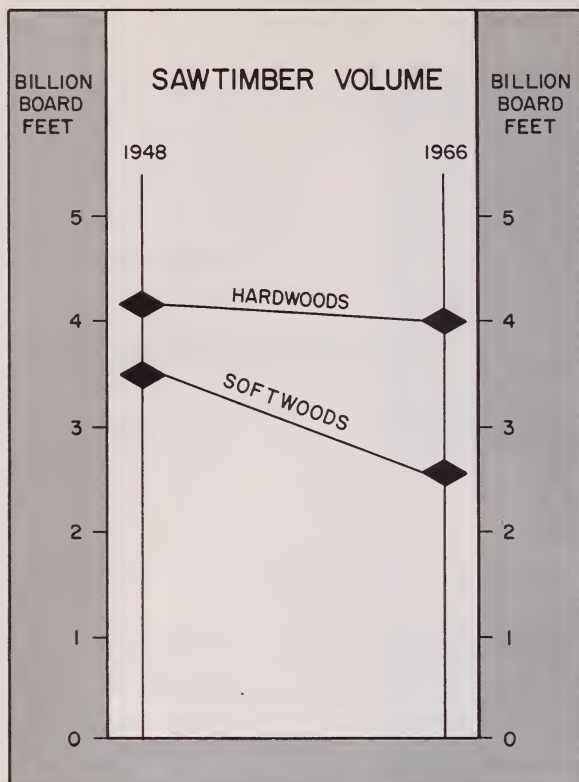
SOFTWOOD SAWTIMBER VOLUME



Softwood volume by species

volume coupled with a slight decline in hardwood volume. Softwood sawtimber volume fell from 3.5 billion board feet in 1948 to 2.6 billion in 1966 because cutting rates were heavy during the first 10 to 12 years of the 18-year period. Cutting trends during the last 5 years indicate that this situation has been reversed and that an increase in softwood sawtimber volume can be expected. Hardwood sawtimber volume declined from 4.1 billion board feet in 1948 to 4.0 billion in 1966. Hardwood volume probably declined because the proportion of cull volume in hardwood sawtimber trees increased.

Nearly 1.4 billion board feet of Vermont's sawtimber volume is sugar maple. Thus sugar maple comprises 35 percent of the hardwood sawtimber volume and 22 percent of all sawtimber. The spruces account for over 36 percent of the softwood sawtimber volume and over 14 percent of all sawtimber volume—959 million board feet. Hemlock is the third most abundant with 673 million board feet, and white and red pine are the fourth



The trend of sawtimber volumes by species group.

most abundant with 654 million board feet. Yellow birch accounts for 597 million board feet of sawtimber. Yellow birch accounted for 15 percent of the sawtimber volume in 1948; in 1966 it accounted for only 9 percent. This decline in the volume of yellow birch sawtimber is primarily the result of heavy cutting for veneer and furniture stock.

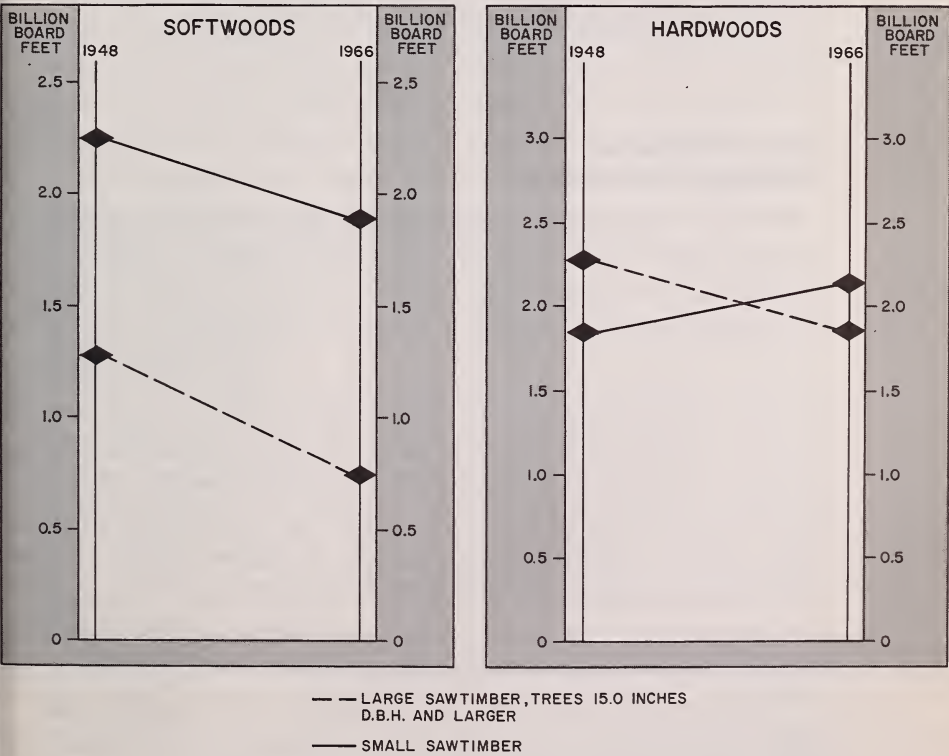
Average Diameter of Sawtimber Trees Declines

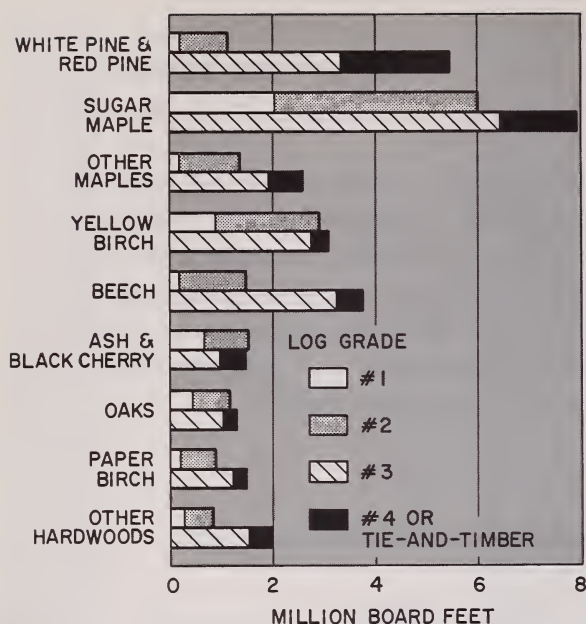
The average softwood sawtimber tree is between 13.0 and 14.9 inches d.b.h. The average hardwood sawtimber tree is between 17.0 and 18.9 inches d.b.h. However, the volume of sawtimber in large sawtimber trees (15.0 inches d.b.h. and larger) has declined both for softwoods and for hardwoods. The volume in large softwood sawtimber trees declined 42 percent between

surveys, while the volume in small sawtimber trees decreased 20 percent. The board-foot volume in small softwood sawtimber trees is now more than double that in the larger trees—1,885 to 742 million board feet.

The situation for hardwoods is less serious. Sawtimber volume in larger hardwood trees decreased 19 percent between 1948 and 1966, while the volume in small hardwood sawtimber trees increased 17 percent. In 1948 the volume in large hardwood sawtimber trees exceeded that of the small trees; however, in 1966 the volume of small hardwood sawtimber trees was 15 percent greater than the volume in large sawtimber trees.

The trend of sawtimber volumes, by species group and tree-size class.





The quality of sawtimber.

Large Volume of Low-Grade Sawtimber

The most sought after sawlogs are those that would be graded sawlog grades 1 and 2. Of the sawtimber in Vermont that was graded, only 37 percent falls in these two log grades. In only one species, ash, does the volume of grade-1-and-2 logs exceed 50 percent, and then only by one-half of 1 percent. White pine has the lowest proportion of grade-1-and-2 logs—16.8 percent. Among the hardwoods yellow birch has 49 percent of its material in the two top grades. While the percent of ash in grades 1 and 2 exceeds that of yellow birch, the volume of ash becomes insignificant when compared with the volume of yellow birch.

Only sugar maple, yellow birch, ash, and oak have 15 percent or more of their volume in grade-1 logs. All the other species have less than 10 percent in this grade.

Three percent of the white pine sawtimber is in grade-1 sawlogs; 14 percent in grade-2; 51 percent in grade-3; and 32 percent in grade-4, as indicated by the volumes shown below:

<i>Grade</i>	<i>Volume (million board feet)</i>
1	17
2	93
3	337
4	207

Twelve percent of hardwood sawtimber is in grade-1 sawlogs; 28 percent in grade-2, 48 percent in grade-3; and 11 percent in the Tie-and-timber grade, based upon the following volumes:

<i>Grade</i>	<i>Volume (million board feet)</i>
1	494
2	1,126
3	1,915
Tie-and-timber	439

Net Growth is Low

Average annual net growth, developed from the remeasurement of permanent forest-survey plots, was 2.8 percent per year for softwood growing stock and 1.9 percent per year for hardwood growing stock. For sawtimber, average annual net growth was 3.5 percent for softwoods and 2.1 percent for hardwoods.

This growth is well below the potential net annual growth of timber in Vermont. Table 8 shows that 38 percent of Vermont's commercial forest land is capable of producing 85 cubic feet per acre per year or more. This indicates that Vermont has a potential net annual growth in excess of 5 percent of the growing-stock inventory volume.

Why is growth so much lower than the potential? A look at the components of net annual growth gives the answer. Table 24 of the appendix shows that average annual mortality as a percent of gross growth ranges from a low of 17 percent for softwood sawtimber to a high of 27 percent for hardwood growing stock. Thus, on the average about one-fourth of the gross growth each year is lost to mortality.

Much of this mortality is associated with the adverse effects of high stand density and improper tree spacing within stands; improper spacing also causes a general lowering of diameter growth rates. A substantial portion of this mortality and lower growth

rate is the result of numerous tree diseases and destructive insect populations present in Vermont forests. Some of these insect populations and tree diseases have reached epidemic proportions as, for example, the beech scale-nectria complex, the spruce budworm, and birch dieback.

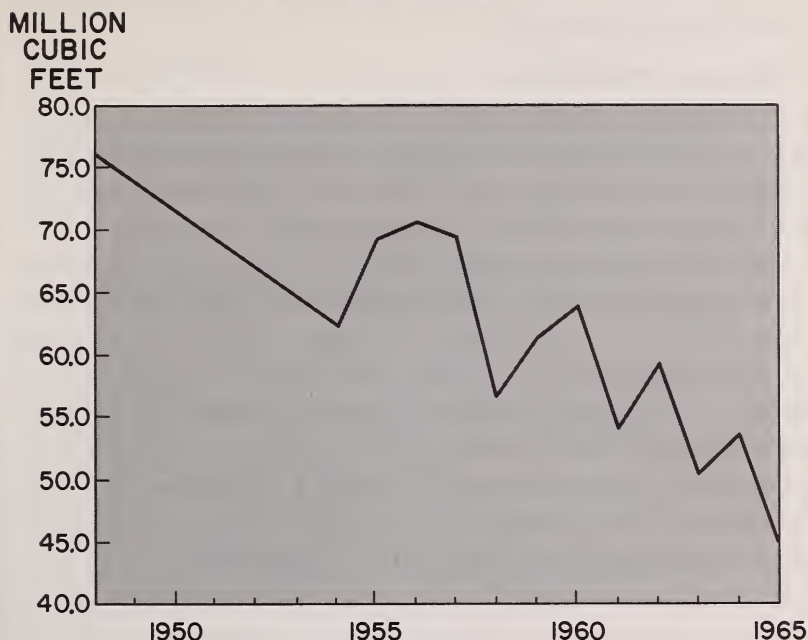
Between surveys the average net annual growth of growing stock exceeded the average annual timber cut for both softwood and hardwood growing stock. However, the average annual cut of sawtimber exceeded the average annual net growth of sawtimber for both softwoods and hardwoods. But because timber cutting in Vermont has recently declined substantially, net annual growth of sawtimber now exceeds the cut for both softwoods and hardwoods. This low level of timber cut probably will continue.

The comparison of growth and cut shows that, while the growth-to-cut relationship is now more favorable than the average growth-cut relationship between forest surveys, it could be made even more favorable if the loss of growth due to mortality were reduced. The implications of this fact are discussed more fully in the sections of this report that deal with future timber supply and with opportunities for forest management.

Timber Products Output

The average annual timber cut shown in tables 21 and 22 of this report was developed from the remeasurement of permanent sample plots and should not be confused with the timber-products output estimates in table 28 and the timber cut in tables 29 through 32, which are based on the 1965 state report of timber-products output. Timber cut based on an average over the period between forest surveys gives a more reliable description of the growth and cut trend and more accurately assesses the changes in the timber inventory since 1948. The timber cut estimates for a particular year are more useful when cut is related to the output of timber products. In this section the data obtained from the state timber-products-output report are utilized and supplemented with information on timber utilization that was developed in conjunction with the forest survey.

The production of timber products from Vermont's forests has generally declined since 1948.



The total production of timber products in Vermont has declined at the rate of 1.6 million cubic feet per year since 1948. In 1948 Vermont produced 75.1 million cubic feet of timber products. By 1965 total timber production had dropped to 45.8 million cubic feet. This decline has not been a constant decline, but rather it has been characterized by several ups and downs.

Sawlog Production

The number of active sawmills in Vermont has declined steadily since the late 1940's. In 1965, 191 sawmills were active in the State. These mills consumed 115.2 million board feet of sawlogs. This volume is nearly 43 percent of the total volume of all timber products produced.

Of the 115.2 million board feet consumed, 65.5 million was hardwood and 49.7 million was softwood. Windsor County produced the largest cut of sawlogs in 1965—15 percent of the

State's total production. Five counties—Windsor, Windham, Addison, Bennington, and Orange—produced 64 percent of Vermont's sawlog production.

Pulpwood Production

Vermont has one operating woodpulp mill, which has a capacity of 44 tons of groundwood pulp per day. Not all of Vermont's pulpwood harvest is consumed in Vermont. Substantial volumes are shipped to New York, New Hampshire, and Canada.

In 1965 Vermont produced 113,000 cords of round pulpwood. This volume represents a decline of 69,547 cords from the 1955 total of 182,547 cords. Most of the State's round pulpwood is softwood—87,000 cords; 80,700 cords of this is spruce and fir. Essex County produced 35,900 cords to lead all other counties. Caledonia produced 16,600 cords in 1965 to place second among the counties. Part of the decline in round pulpwood production in Vermont has been offset by an increase in the production of chips for woodpulp manufacture. In 1965 Vermont chipping plants produced the equivalent of 36,000 cords of pulpwood from sawmill slabs and edgings. Most of this volume, 29,900 cords, was hardwood.

The pulpwood chip industry has shown recent outstanding growth. In 1963 Vermont produced 17,700 cords of pulpwood chips. Not all the chips produced in Vermont are produced from slabs and edgings from Vermont sawmills. About 8,900 cords were produced from sawmill slabs and edgings shipped into Vermont from other states. In addition to the volume of pulpwood in round form and in chips, Vermont produced 1,100 cords of veneer cores and other wood-industry residues that were utilized by pulpmills. In total, Vermont produced 150,100 cords of all forms of pulpwood in 1965.

Veneer Production

The veneer industry in Vermont primarily produces high-quality veneer from northern hardwood species like yellow birch. In 1965 Vermont had seven veneer plants. This industry has been relatively steady with occasional dips and recoveries. In 1954 the State produced 14 million board feet of veneer logs. By 1961

production had dropped to 10 million, but in 1965 it was over 15 million feet.

Other Products

Besides sawlogs, pulpwood, and veneer logs, Vermont also produces a variety of other timber products. These other products include turnery bolts, bobbins for the textile industry, wooden bowls, clapboards for siding, novelty fence products, posts, poles, piling, and fuelwood. These products account for nearly 26 percent—11.7 million cubic feet—of Vermont's total timber-products output.

The largest of these other products is fuelwood, which accounted for 73,420 cords in 1965. However, fuelwood constitutes a relatively minor drain on the growing-stock base because only about 41 percent of the fuelwood production comes from growing stock. The remaining 59 percent is produced from sawmill residues, dead trees, rough and/or rotten trees, and trees not on forest land like trees in fence rows and shade trees.

With the exception of fuelwood, the largest single product in the other-products category is boltwood. In 1965 this product amounted to 15.8 million board feet. Generally these bolts are manufactured into turned or routed handles for various items from paint brushes and screw drivers to ax handles and squares for the furniture industry. In 1965 Vermont had 25 establishments that consumed such bolts.

The bobbin industry, which utilizes primarily hard (sugar) maple and birch, is a long-standing industry in northern New England. This industry supplies bobbins and spindles to the textile industry. After World War II the textile industry began to move out of southern New England; and this exodus, to some degree, caused a decline in the bobbin industry's rate of growth. Production between 1954 and 1965 fell from a high of 16.5 million board feet in 1956 to a low of 6.7 million in 1963. By 1965 production had risen to 8.7 million feet. The future of this industry is somewhat questionable, particularly if other materials can be substituted for bobbins. However, as of 1965 there were still six bobbin mills in the State.

SOME SCENES OF VERMONT'S VARIED FOREST PRODUCTS INDUSTRY



Hauling out red spruce sawlogs with a team and sled.

Rotary cut yellow birch veneer — one of Vermont's higher valued forest products.



The 1967 National Christmas tree came from Vermont.



Some of Vermont's many maple sugar products.





Rustic log cabin being built from a pre-cut kit.



A rick of spruce pulpwood.



Stacking lumber to air dry.

Shipping pallets manufactured from local lumber.



Inspecting turned hardwood bowls for dryness.



The hardwood bowl industry is another small but important industry in Vermont. This industry primarily utilizes hard maple also. The bowls are a popular tourist item. This industry consumed a little over 1½ million board feet in 1965.

Timber Supply Outlook

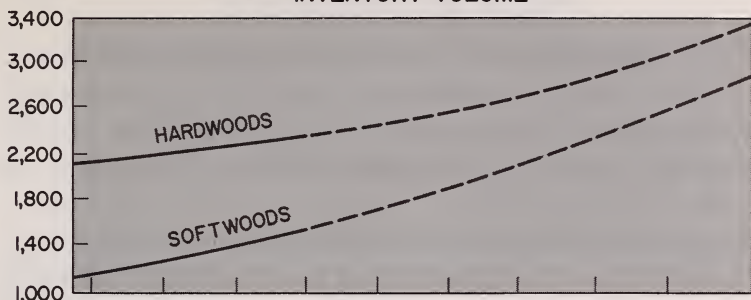
All long-range projections of timber supply are subject to many uncertainties. The results of such projections can only be considered in the light of the basic assumptions that must precede the projections.

The following assessment of the future supply of timber in Vermont is based on several principal assumptions. The first assumption is that the annual timber cut will decrease at the rate of 2 percent per year until 1976 and then timber cut will remain constant for the remainder of the projection period, 1976 to 1996. This decline in timber cut will not be evenly distributed between hardwoods and softwoods. It is anticipated that the decline in softwood cut will be 2.5 percent per year. The reason for these assumptions is that over the 18 years between forest surveys annual timber cut has declined at slightly more than 2 percent (2.2 percent) per year. The recent trend in softwood cut shows an average annual decline of about 2.5 percent per year. We do not foresee any economic or industrial developments that will reverse this trend in Vermont's timber cut.

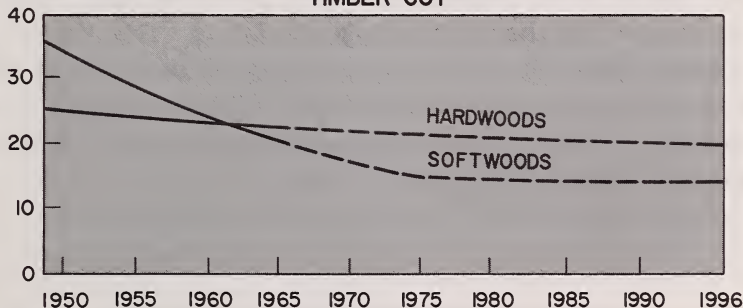
The remaining assumptions are that forest land area will not increase or decrease significantly and that, as a percent of growing-stock volume, net annual growth of growing stock and annual mortality of growing stock will remain at the 1965 levels. Vermont is now 73 percent forested. Most of the State's present un-forested open land is located in the fertile Champlain Valley or in the Connecticut River Valley and is prime agricultural and pasture land. It appears highly improbable that any significant amount of this land will be allowed to revert to forest land. Because data are not available that will show relative changes in

MILLION
CUBIC
FEET

INVENTORY VOLUME



TIMBER CUT



All growing stock projected growth and cut.

growth and mortality as the density of timber stands increases, these factors have to be held at the 1965 level. This fact forces the ending volume estimate, in 1996, to be slightly higher than might be expected realistically.

The projection clearly shows that Vermont will have an ample supply of timber for the next 30 years. However, it appears almost certain that, though timber quantity will not be wanting, timber quality will be unless vigorous efforts are made to improve it. The average stocking of timber stands in Vermont is unusually high, and the projection indicates that stocking will become even higher. Overcrowded stands are less vigorous than more favorably stocked stands, so the incidence of disease and insect damage is greater. Therefore one can expect that even more quality growing stock will be lost to cull and mortality than is now the case in Vermont.

Management Opportunities

The forest survey has clearly shown that the forest resources of Vermont are not as productive as they could be. For example, the net growth of growing stock averages only about 19 cubic feet per acre per year. Yet net growth could average 40 cubic feet per acre per year or more.

The quality of the growing stock in the State's timber stands also leaves much to be desired. Very few stands in Vermont are well stocked with desirable trees. Only 2.9 million acres of forest land are well stocked with growing-stock trees. This means that nearly a third of Vermont's forest land is predominantly stocked with trees that are too poor to be considered growing stock. Table 13 of the appendix shows that 26 percent of all trees in Vermont's stands are classified rough and/or rotten.

A forester marks a large red maple for cutting.



Previous sections of this report and many of the tables in the appendix clearly attest to the present conditions of much of Vermont's forest land. To present these data again in this section would be redundant. Suffice it to say that in Vermont ample opportunities for more extensive timber management exist. The purpose of this section is to point out some of these opportunities and to suggest ways to improve the productivity of the State's forest land.

Timber-Stand Improvement

An excellent opportunity exists to increase the area of commercial forest land that is well stocked with desirable growing-stock trees and to raise the average net annual growth of growing stock by timber-stand-improvement treatments. A high growth rate of quality material could be realized if mature, surplus, and rough and rotten trees were removed, and if various other silvicultural treatments that would improve tree spacing, timber quality, and stand vigor were applied.

Low-quality trees can be removed by direct timber-stand-improvement programs, by timber sales, and by encouraging the establishment of industries that will utilize low-quality material in bulk.

The role of the forester in helping to accomplish these tasks is important. Foresters can assist timber owners in marking and selling timber. Wherever possible, cutting contracts should specify the removal of cull trees, and cuts should be designed to improve the stand—particularly to improve stocking with desirable trees properly spaced in the stand. In marking stands for cutting the forester generally will recognize four important types or classes of trees that should be removed:

- Trees that may die before the next cut.
- Trees of low quality and vigor.
- Less desirable species.
- Multiple-stem trees.

Vermont has large areas in two major stand groups: (1) old growth, essentially unmanaged stands that frequently contain a high proportion of mature, overmature, and rough and/or rotten trees; and (2) young even-aged stands that resulted from heavy cutting 60 to 80 years ago and that are now reaching merchantable size.

In old-growth stands that contain a good proportion of desirable trees and where uneven-aged management for tolerant species is the objective, group or individual tree selection cuttings may be applied. The initial cut should remove most of the older and defective trees. In old-growth stands that contain very few promising younger trees or where the management objective is for the less tolerant species, the initial cut should be a harvest in



A thinned red pine plantation. Thinning improves tree spacing, which results in faster growing, higher quality trees.



Undesirable or rough and/or rotten trees often must be girdled or removed. Here a forester girdles a beech (*Fagus grandifolia*) that has become infected by beech scale-nectria complex (*Cryptococcus fagi-Nectria coccinea* var. *faginata*).

the form of clearcutting or strip, patch, or shelterwood cutting. All unmerchantable trees also must be removed from clearcut areas—including the small openings made by strip, patch, or group selection cutting. Adequate seedbeds also either must be present in these openings naturally or must be prepared mechanically, particularly if regeneration of paper birch and yellow birch is the objective.⁹

⁹ For a further discussion of the management of northern hardwoods see: Gilbert, Adrian M. and Victor S. Jensen. A MANAGEMENT GUIDE FOR NORTHERN HARDWOODS IN NEW ENGLAND. NE. Forest Exp. Sta. Sta. Paper 112. 22 pp., illus. Upper Darby, Pa. 1958.

In the younger even-aged stands, initial cuts should be improvement cuts to favor the desired species, eliminate defective and less desirable stems, and stimulate the growth rate. Periodic cutting and timber-stand-improvement treatments may then be scheduled to maintain growth and quality of the stand to maturity. Occasionally an apparently good site will be occupied by a young stand that does not contain enough valuable or potentially valuable stems to form an acceptable stand. In such cases the stand must be clearcut and a new stand of acceptable trees regenerated.

The encouragement of industries that will utilize low-quality material is invariably desirable. Few, if any, states have enough of these industries. Therefore, it would be unrealistic to expect to encourage enough of these industries to do more than a small fraction of the timber-stand-improvement job. Yet, they should be encouraged so that they may contribute as fully as possible.

Insects and Diseases

Control of the many destructive insects and diseases that plague Vermont's forests presents another opportunity to increase the quantity and to improve the quality of the future timber supply. Each year 24 percent of the gross growth of growing stock is lost to mortality (table 24). By comparison, the average annual timber cut of growing stock (table 30) equals only 39 percent of gross growth. Clearly, a substantial reduction in mortality could materially increase the amount of timber available for harvest.

However, mortality is only a part of the loss caused by disease and insect pests. Thousands of dollars are lost annually because insects and diseases reduce growth rates, weaken trees, and make low-value or worthless rough and rotten trees of what were once growing-stock trees.

Specific efforts are necessary to combat the effects of insects and diseases. The healthy, vigorous stands that can be developed through timber-stand-improvement programs can help prevent some insect and disease losses. However, the major opportunity for reducing insect and disease losses lies in direct, specific programs aimed at specific pests. Many control programs already are

operating in the State. These programs could well be expanded to provide control for a larger share of Vermont's timber lands.

Many forest insect and disease pests are not well understood. These provide an opportunity for much needed research and for development of effective controls. Ample opportunity also exists to develop more effective and less costly control methods that can be applied to those pests for which control methods already exist.

Forest Land Ownership

As pointed out earlier, 43 percent of Vermont's commercial forest land is in the miscellaneous private ownership category and 31 percent is owned by farmers. This means that 74 percent of the State's commercial forest land is in ownership categories characterized by relatively small individual holdings. Many of these small ownerships are too small for effective timber management. Then too, these properties change hands more frequently than do larger tracts. These facts profoundly affect timber-management planning.

Stability of ownership or the continuation of a positive attitude on the part of the owners is an important prerequisite to successful forest management. One treatment of a stand in a management cycle may not achieve its proportional part of stand improvement. This means that if four treatments are needed, one treatment may yield considerably less than one-quarter of the benefit that could be obtained from the full four treatments. In view of this, how might management programs be altered for different sizes of ownership and different owner groups to achieve the maximum success? Forestry assistance groups might best give their maximum effort to those larger holdings—public lands, industrial lands, and larger private ownerships—where stability of ownership and owner attitude indicate that the holding is very likely to be available for continued management over an extended period of time.

The owners of small forest tracts should not be ignored. These owners could be assisted in marking and marketing. Demonstration stands could be set up and educational programs and literature made available. Great interest in forest management could



The American Tree Farm Program has been a valuable stimulus to timber management on private lands.

be generated when other owners see successfully managed, profitable forests around them. Ways should be investigated to encourage these owners to form voluntary associations and organizations to achieve economic timber-management and timber-marketing units.

Summary

The development of healthy, vigorous stands of high-quality trees can be a valuable asset to Vermont's economy. The decline of timber quality in Vermont has in large part been responsible for the decline in the production of timber products over the past 18 years. Unless timber-management activities are expanded to

develop higher quality, faster growing timber, this decline very likely will continue.

The opportunities for timber management in Vermont can nearly be summed up on one word—expand. If Vermont's forests are to realize their full potential for timber production, timber-management efforts must be expanded. Past forestry efforts in the State, while technically sound, have not developed the vigorous high-quality productive stands that Vermont needs because the area under continued forest management is too small to influence the conditions significantly.





Appendix

DEFINITION OF TERMS

Forest Area

Forest land. — Land at least 10 percent stocked with forest trees of any size, or formerly having such tree cover, and not currently developed for nonforest use. The minimum area for classification of forest land, or subclasses of forest land (commercial forest land, noncommercial forest land, productive-reserved forest land, and unproductive forest land), is 1 acre. Roadside and streamside strips of timber must have a crown width of 120 feet or more to qualify as forest land. Unimproved roads and trails, streams, and clearings less than 120 feet wide are classified as forest.

Commercial forest land. — Forest land that is producing or is capable of producing timber crops and that is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for timber management and capable of producing in excess of 20 cubic feet per acre of annual growth. This includes both accessible and inaccessible and both operable and inoperable trees.

Noncommercial forest land. — Forest land that is incapable of yielding timber crops because of adverse site conditions (unproductive forest land), and productive forest land that is withdrawn from commercial timber use through statute or administrative regulation (productive-reserved forest land).

Productive-reserved forest land. — See noncommercial forest land.

Unproductive forest land. — See noncommercial forest land.

Nonforest land. — Land that has never supported forests; and lands formerly forested but now in nonforest uses like crops, pasture, urban areas, and the like.

Ownership Classes

National forest lands. — Commercial forest land under the administration of the National Forest Administration Branch of the U. S. Forest Service.

State forest land. — Commercial forest land owned or leased by the State for more than 50 years, and designated State Forest.

Other public forest land. — Commercial forest land owned or administered by any Federal agency or by any state, county, or municipal government other than the National and State forests.

Farmer-owned lands. — Commercial forest land owned by operators of farms. Land not connected to the farmstead is included if owned by a farm operator.

Other private forest land. — Privately owned commercial forest land other than farmer-owned or forest industry lands.

Forest industry lands. — Lands owned by companies or individuals operating wood-using plants.

Stand-Size Classes

Stand. — A growth of trees on a minimum of 1 acre of forest land that is at least 10 percent stocked by forest trees of any size.

Sawtimber stands. — Stands at least 10 percent stocked with growing-stock trees; with half or more of this stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands. — Stands at least 10 percent stocked with growing-stock trees, with half or more of this stocking in poletimber and/or sawtimber trees and with poletimber stocking exceeding that of sawtimber.

Sapling-and-seedling stands. — Stands at least 10 percent stocked with growing-stock trees and with saplings and/or seedlings comprising more than half of this stocking. Sapling-and-seedling stands may have poletimber and/or sawtimber volume. This will be particularly true for cut-over areas where seed trees or part of the original stand has been left as a seed source and where pastures or farm lands with a few large old trees have begun to revert to forest land.

Nonstocked areas. — Commercial forest land less than 10 percent stocked with growing-stock trees.

Forest Types

White-red pine. — Forests in which eastern white pine or red pine, singly or in combination, comprise a plurality of the stocking. (Common associates include hemlock, aspen, birch, and maple.)

Spruce-fir. — Forests in which spruce or true firs, singly or in combination, comprise a plurality of the stocking. (Common associates include white cedar, tamarack, maple, birch, and hemlock.)

Oak-pine. — In Vermont, forests in which hardwoods (usually northern red oak and white ash) comprise a plurality of the stocking but in which white pine comprises 25 to 50 percent of the stocking. (Common associates include pitch pine, eastern redcedar, red pine, hickory, and other oaks.)

Oak-hickory. — Forests in which upland oak or hickory, singly or in combination, comprise a plurality of the stocking except where pines comprise 25 to 50 percent in which case the stand is classified oak-pine. (Common associates include elm and maple.)

Elm-ash-red maple. — Forests in which elm, ash, or red maple, singly or in combination, comprise a plurality of the stocking. (Common associates include beech, sugar maple and birch.)

Maple-beech-birch. — Forests, in which maple, beech, or yellow birch singly or in combination, comprise a plurality of the stocking. (Common associates include hemlock, elm, basswood, and white pine.)

Aspen-birch. — Forests in which aspen, paper birch, or gray birch, singly or in combination, comprise a plurality of the stocking. (Common associates include red maple, balsam fir, white spruce, and black spruce.)

Class of Timber

Commercial species. — Tree species now or prospectively suitable for industrial wood products. Noncommercial species are those not now nor prospectively suitable for industrial wood products. Gray birch and striped maple are examples of noncommercial species.

Growing-stock trees. — All live trees except rough and/or rotten trees.

Sawtimber trees. — Live trees of commercial species containing at least one 12-foot sawlog. Softwoods must be at least 9.0 inches in diameter at breast height and hardwoods must be at least 11.0 inches in diameter at breast height.

Poletimber trees. — Live trees of commercial species at least 5.0 inches in diameter at breast height, but smaller than sawtimber size, and of good form and vigor.

Saplings. — Live trees of commercial species 1.0 to 5.0 inches in diameter at breast height and of good form and vigor.

Seedlings. — Live trees of commercial species less than 1.0 inch in diameter at breast height that are expected to survive.

Desirable trees. — Growing-stock trees that have no serious defects in quality that limit present or prospective use, have relatively high vigor, and contain no pathogens that may result in death or serious deterioration before rotation age. They include the type of trees forest managers aim to grow; that is, the trees that would be favored in silvicultural operations.

Rough and/or rotten trees. — Live trees of sawtimber or poletimber size that do not contain at least one 12-foot sawlog now or prospectively because sweep, crook, poor form, or rot is excessive or because they are of noncommercial species.

Measurements and Units of Measure

Area-condition classes. — A classification of commercial forest land based upon stocking by desirable trees and other conditions affecting current and prospective timber growth. For a listing and description of area-condition classes see the footnote to appendix table 7.

Stocking. — The degree of occupancy of land by trees, measured in terms of basal area and/or the number of trees in a stand compared to the basal area and/or number of trees required to utilize fully the growth potential of the land. The actual stocking at a point was evaluated against a standard of 60 square feet of basal area per acre for trees 5.0 inches d.b.h. and larger, or its equivalent in numbers of trees per acre for seedlings and saplings. The stocking percentage for a sample plot is derived from the stocking for each of the 10 points. Three categories of stocking are used:

- All live trees. — These are used in the classification of forest land and forest types.
- Growing-stock trees. — These are used in the classification of stand-size classes.
- Desirable trees. — These are used in the classification of area-condition classes.

Basal area. — A unit of measure used to express stand density, growth, and cut. The basal area of a tree is the area of the cross section at breast height expressed, usually, in square feet. Thus, the basal area of a stand would be the sum of the areas of cross section of all trees, growing-stock

trees, or desirable trees — depending upon the use to which the estimate is to be put.

Diameter at breast height (d.b.h.). — Tree diameter in inches, outside bark, measured at $4\frac{1}{2}$ feet above ground.

Diameter classes. — The 2-inch diameter classes extend from 1.0 inch below to 0.9 inch above the stated midpoint. For example, the 6-inch class contains trees 5.0 to 6.9 inches d.b.h.

Board foot. — One board foot equals the volume of a board 1 foot long by 1 foot wide and 1 inch thick. This is the standard unit of measure for lumber in the United States and Canada.

Standard cord. — A unit of measure for stacked wood encompassing 128 cubic feet of wood, bark, and air space. Cord estimates can be derived from cubic-foot estimates by applying a factor of 80 cubic feet of wood (inside bark) per rough cord.

Timber Volume

Volume of sawtimber. — Net volume in board feet of merchantable sawlogs in live sawtimber trees. Net volume equals gross volume less deductions for rot, sweep, and other defects that affect use for lumber. All sawtimber and lumber volumes in this report are based on the International $\frac{1}{4}$ -inch rule for estimating log volumes in board feet.

Volume of growing stock. — Volume of sound wood in the bole of sawtimber and poletimber trees from a 1-foot stump to a minimum 4.0 inch top outside bark or to the point where the central stem breaks into limbs.

Growth and Cut of Timber

Gross growth of all trees. — Growth of all trees without reduction for cull and including growth of rough and rotten trees plus annual mortality.

Net annual gross growth. — Net annual growth (gross growth minus cull) plus annual mortality.

Net annual growth of growing stock. — The annual change in volume of sound wood in live sawtimber and poletimber trees. (Growth minus mortality).

Net annual growth of sawtimber. — The annual change in net board-foot volume of live sawtimber trees.

Mortality of growing stock. — The volume of sound wood in live sawtimber and poletimber trees dying annually from natural causes.

Mortality of sawtimber. — The net board-foot volume of sawtimber trees dying annually from natural causes.

Timber cut from growing stock. — The volume of sound wood in growing-stock trees cut for forest products during a specified period, including both roundwood products and logging residues.

Timber cut from sawtimber. — The net board-foot volume of live sawtimber trees cut for forest products during a specified period, including both roundwood products and logging residues.

Timber products. — Roundwood products and byproducts of wood manufacturing plants.

Logging residues. — The unused growing-stock portion of growing-stock trees cut for products and left in the woods, and also growing-

stock trees destroyed or removed in the course of logging and not utilized for products.

Minimum full utilization. — The minimum stand density required to utilize fully the potential of the site. For Vermont this has been defined as 60 square feet of basal area per-acre.

Log Grades

Log grades are a classification of logs based on external characteristics as indicators of quality or value. Log grade standards and grading systems for eastern tree species are outlined below.

SPRUCE, FIR, HEMLOCK, TAMARACK AND CEDAR LOGS

Minimum merchantability specifications

<i>Diameter inside bark</i> ¹	<i>Length</i> ²	<i>Total deduction</i>	<i>Sweep permitted</i>	<i>Other requirements</i>
<i>Inches</i>	<i>Feet</i>	<i>Percent</i>	<i>Percent</i>	
6-12	8-16 in 2-foot multiples	50	25	Sound knots not over 2 inches in diameter permitted. Shake permitted up to 20 percent of gross scale if not combined with other serious defects.
13 +	8-16 in 2-foot multiples	50	25	Sound knots not over 3 inches in diameter permitted. Shake permitted up to 20 percent of gross scale if not combined with other serious defects.

¹ At small end of log.

² Without trim.

WHITE PINE LOG GRADES

Trial specifications (revised)

Log grade	Minimum size		Defect allowance		Maximum weevil injury	Allowable knot size (inches on 3 best faces or minimum cleanness on 4 faces)
	Diameter	Length ¹	Sweep or crook	Total cull including sweep		
No. 1 (Select)	Inches 12 & 13	Feet 8-16	Percent 20	Percent 50	Number 0	4 faces free of knots 1/2 inch or larger full length of log.
	14 +	10-16	20	50	0	2 faces free of knots 1/2 inch or larger full length of log, or 4 faces free of knots 1/2 inch or larger 50 percent length of log (6 feet minimum length), or %.
No. 2 (Finish)	6 +	8-16	30	50	0	Sound red knots \leq^3 D/6 and no larger than 3 inches. Black knots: Butt logs \leq (D/12) and no larger than 1 1/2 inches. Upper logs \leq (D/10)) and no larger than 1 1/2 inches or larger than 1 1/2 inches or 4 faces free of knots 1/2 inch or larger 50 percent length of log.
	6 +	8-16	40	50	8 foot logs: 1 weevil 10 foot + logs: 2 weevils	Sound red knots \leq D/3 and no larger than 5 inches. Black knots \leq D/6 and no larger than 2 1/2 inches.
No. 3 (Premium)	6 +	8-16	50	50	No limit	No limit.
No. 4 (Standard)	6 +	8-16	50	50	No limit	No limit.

¹ Plus trim.

² If the sum of the diameters of sound red knots plus 2 times (sum of the diameters of dead or black knots) in inches is \leq 1/2 the diameter of the log (in inches).

³ \leq means equal to or less than.

HARDWOOD LUMBER LOGS

Grade factors *		Specifications				
		Log grade 1		Log grade 2		Log grade 3
Position in tree		Butts only	Butts and uppers		Butts and uppers	
Minimum diameter (inches)		13-15 ¹	16-19	20+	11 ²	12+
Minimum length (feet)		10+	10+	10+	10+	12+
Clear cuttings** on each of the 3 best faces	Minimum length (feet)	7	5	3	3	3
	Maximum number	2	2	2	2	2
	Minimum yield in face length	5/6	5/6	5/6	2/3	2/3
Maximum sweep and crook allowance (percent of gross volume)		15		30		50
Maximum cull and sweep allowance (percent of gross volume)		40 ³		50 ⁴		50

* End defects, although not visible in standing trees, are important in grading cut logs. Instructions for dealing with this factor are contained in Forest Prod. Lab. Rpt. D1737.

** A clear cutting is a portion of a face free of defects, extending the width of the face. A face is one-fourth the surface of the log as divided lengthwise.

¹ Ash and basswood butts can be 12 inches if otherwise meeting requirements for small No. 1's.

² Ten-inch logs of all species can be No. 2 if otherwise meeting requirements for small No. 1's.

³ Otherwise No. 1 logs with 51 to 60 percent cull can be No. 2.

⁴ Otherwise No. 2 logs with 51 to 60 percent cull can be No. 3.

TIE-AND-TIMBER LOGS

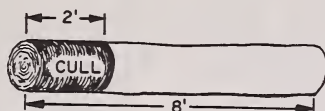
<i>Grade factors</i>		<i>Specifications</i>
Position in tree		Butts and uppers
Scaling diameter (inches)		8 +
Length, without trim (feet)		8 +
Clear cuttings		No requirements: not graded on cutting basis.
Maximum sweep allowance		One-fourth d.i.b. of small end for half logs, and one-half d.i.b. for logs 16 feet long.
Sound surface defects permitted	Single knots	Any number, if none has an average collar* diameter that is more than one-third of log diameter at point of occurrence.
	Whorled knots	Any number, provided the sum of the collar diameters does not exceed one-third the log diameter at point of occurrence.
	Holes	Any number not exceeding knot specifications if they do not extend more than 3 inches into the contained tie or timber.
Unsound surface defects** permitted	Any number and size if they do not extend into contained tie or timber. If they extend into contained tie or timber, they shall not exceed size, number, and depth of limits for sound defects.	

* Knot collar is the average of the vertical and horizontal diameters of the limb or knot swelling as measured flush with the surface of the log.

** Interior defects are not visible in standing trees. They are considered in grading cut logs. No interior defects are permitted except one shake not more than one-third the width of the contained tie or timber, and one split not more than 5 inches long.

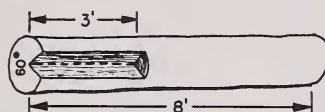
METHODS OF DETERMINING SCALING DEDUCTION

(Examples based on an 8-foot log with 20-inch scaling diameter)



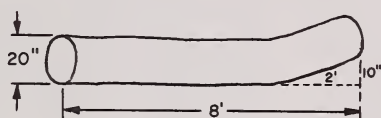
If section of bole is affected, deduct percent of log length affected.

$$\text{Example: } \frac{2}{8} = 25 \text{ percent cull}$$



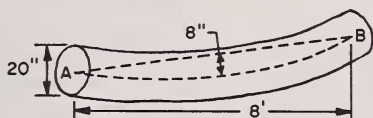
If sector is affected, multiply percent of circle times percent of length.

$$\text{Example: } \frac{60^\circ}{360^\circ} \times \frac{3}{8} = 6 \text{ percent cull}$$



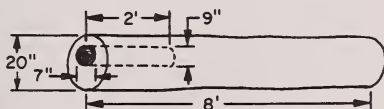
For a crook, multiply proportion of diameter displaced times proportion of log length affected by crook.*

$$\text{Example: } \frac{10}{20} \times \frac{2}{8} = 12 \text{ percent board-foot cull}$$



For a sweep, determine sweep departure and subtract 1 inch for 8-foot logs or 2 inches for 16-foot logs. Divide by diameter.

$$\text{Example: } \frac{8 - 1}{20} = 35 \text{ percent board-foot cull**}$$



For interior cull, square out interior cull as a percent of total volume of the section. For board-foot cull, add 1 inch to width and to thickness; for cubic-foot cull, use actual dimensions of rot. For board-foot cull divide width and thickness by the scaling diameter (average d.i.b., small end) minus 1; for cubic-foot cull, divide by scaling diameter. Multiply fractions by percent of log affected.

$$\text{Example: } \frac{8 \times 10}{20 - 1} \times \frac{2}{8} = 6 \text{ percent cubic-foot cull.}$$

* No reduction of cubic-foot volume will be made.

** If a straight line between A and B falls outside the bark, the affected section is over 50 percent cull in board feet.

FOREST-SURVEY METHODS

Forest area and timber volume estimates are based upon information obtained from two sets of aerial photographs (10 or more years between the two) and sample photo plots and ground plots. Photo plots were pin-pointed on each set of aerial photographs so they were distributed uniformly over the entire State. Each photo plot was classified as either forest or nonforest, and each forest plot was classified into sampling strata. These strata were stand-size classes on the initial survey and were cubic-foot-volume-per-acre classes on the resurvey.

Field crews on the first survey inspected on the ground many sample plots selected from the photo plots. Area, volume, and growth were recorded. These data were the basis for the initial estimate of the timber resources of Vermont.

A sample of 260 of the initial ground plots were visited on the resurvey. These consisted of 88 plots on the Green Mountain National Forest, which was one of the five geographic sampling units. The remaining 190 plots were on all other land and were distributed throughout the state in two sampling units. Plot centers were relocated and trees were retallied. The two tallies were reconciled with each other on the plot.

Data from the remeasured plots were used to obtain the first part of a combined estimate of current forest area and timber volume, and estimates of net annual growth, mortality, and timber cut. Regression equations calculated from the remeasured plots brought up to date the volume estimates of the first survey.

A second estimate of volume and area was calculated from 820 new ground plots. These plots were a sample of the photo interpretation of 10,253 photo points in the most recent aerial photography.

Volume estimates for both the remeasured and the new ground plots were calculated using one of 17 species-group equations. To make the cubic-foot volume calculations, remeasured plot data on height and merchantability by d.b.h. class were used. Similar ratios were developed to convert gross cubic-foot volume to net board-foot volume.

The two estimates of volume and area were weighted by their variance reciprocal and combined. This resulted in a new estimate of total acreage and of total volume. The associated sampling error for each total was also obtained. These totals were then partitioned into the various categories of area and volume (e.g. volume by species and d.b.h. class) using the data obtained from the new ground plot sample.

Estimates of average net annual growth, mortality, and timber cut were based entirely upon the 260 remeasured plots. The volume of growing stock on the plots at time of remeasurement (consisting of both live growing-stock trees and trees that were cut) minus the volume of growing-stock trees on the plots at the time of the forest survey equals net volume growth for the years between measurement.

Stump measurements were used to estimate volumes of cut trees. Measurement of dead trees that were initially classified as live growing-stock trees provided the estimates of mortality.

These estimates for the period between surveys were converted to average net annual growth, mortality, and timber cut by dividing by the number of years between measurements for each plot.

In recent years users of forest-survey data have shown a need for



Foresters estimate volume of a tree on a forest survey plot.

county information. To provide such information, within the framework of the survey design, county tables have been developed based on a survey unit partitioning technique. First the survey unit means and variances for the various photo plot strata are applied to the photo plot data for each county within the survey unit. This yields an estimate of total volume or total commercial forest land area for each county. The associated sampling errors are also calculated for each county total. Next, the data from the new ground plots are used to partition the county totals into their various components. For example, if a table of cubic-foot volume by species is to be made for a county, the estimate of total cubic-foot volume for that county is partitioned into species totals according to the species proportion for all the forest survey new ground plots within the unit.

Comparisons Between Inventories

To evaluate the condition of the forest resource, it is helpful to compare the current inventory with data from the previous inventory. This enables one to assess the trend during the period between inventories. However, for the comparison to be valid, the procedures of the two inventories must be consistent. For example, the use of different volume tables in successive

inventories could lead to totally irrelevant conclusions about the trend between the inventories.

A comparison of the two forest-survey estimates of volume, growth, cut, and mortality in Vermont was made. A computer program TRAS (Timber Resource Analysis System) was utilized.

Analysis of the procedures used in the first inventory revealed numerous differences in the volume estimation procedure when compared to the method used in the second inventory. This does not imply that the initial inventory of Vermont was invalid. The initial inventory was the most reliable estimate possible utilizing the procedures available in 1948. The second inventory is based on newer procedures. *For comparison purposes only*, several adjustments in the initial inventory are necessary.

The initial and the second inventory estimates of the softwood component of volume are comparable. However, the hardwood component is not comparable. Differences in the tree volume estimation procedure are the most probable cause of this. Consequently, by applying the second inventory board-foot and cubic-foot volumes for hardwood species to the initial numbers of trees, a comparable initial inventory was obtained. This comparison initial estimate of hardwood volume is used whenever inventory comparisons are made in this report.

All of the comparisons between inventories are made on the basis of state totals. Survey sampling units were not the same at each occasion, so comparisons at this level are not possible. The present units will be used for the third inventory so comparisons between units will be possible at that time. The procedure for obtaining county data (See: "Forest survey methods") does not make possible comparisons of inventory trend for a county.

Reliability of the Estimates

The forest-area and timber-volume data in this report are based on a carefully designed sample of forest conditions throughout Vermont. However, since neither every acre nor every tree in the State was measured, the figures in this report are the best estimates. A measure of the reliability of these estimates is given by a sampling error. Each estimate in this report had a computed sampling error. Included with the statistical tables are the corresponding sampling errors for row totals and column totals.

Briefly, here is how the sampling error indicates reliability. Our report of the total growing-stock volume in Vermont, 3,765 million cubic feet, has an associated sampling error of 1.9 percent (71.5 million cubic feet). This means that our best estimate of the total growing-stock volume in 1966 is 3,765 million cubic feet. And if there are no errors in procedure, the odds are 2 to 1 that if we repeated the resurvey in the same way, the new estimate of growing-stock volume would be between 3,693 million and 3,836 million cubic feet ($3,765 \pm 71.5$). Similarly, the odds are 19 to 1 that it would be within ± 143 million cubic feet of the present estimate, and 300 to 1 that it would be within ± 214 million cubic feet.

The computed sampling error is not a complete measure of reliability; there are other sources of error that this term does not include. There could be imperfections in our volume tables and equations and errors in field measurement. Procedural errors were kept to a minimum by careful

training of all personnel, frequent inspection of field work, and application of the most reliable survey methods.

Computed sampling errors for the totals shown in the statistical tables are:

	Sampling error (percent)
Commercial forest area	
4.3 million acres	1.2
Growing stock volume	
3.8 billion cubic feet	1.9
Sawtimber volume	
6.6 billion board feet	1.9
Average net annual growth	
84.8 million cubic feet	25.2
Average annual timber cut	
59.4 million cubic feet	15.3

COMMON COMMERCIAL SPECIES OF VERMONT¹⁰

Softwoods

Northern white cedar	<i>Thuja occidentalis</i>
Eastern redcedar	<i>Juniperus virginiana</i>
Balsam fir	<i>Abies balsamea</i>
Eastern hemlock	<i>Tsuga canadensis</i>
Jack pine	<i>Pinus banksiana</i>
Pitch pine	<i>P. rigida</i>
Red (Norway) pine	<i>P. resinosa</i>
Eastern white pine	<i>P. strobus</i>
Black spruce	<i>Picea mariana</i>
Norway spruce	<i>P. abies</i>
Red spruce	<i>P. rubens</i>
White spruce	<i>P. glauca</i>
Tamarack (eastern larch, hackmatack)	<i>Larix laricina</i>

Hardwoods

Black ash	<i>Fraxinus nigra</i>
Green ash	<i>F. pennsylvanica</i>
White ash	<i>F. americana</i>
Bigtooth aspen	<i>Populus grandidentata</i>
Quaking aspen	<i>P. tremuloides</i>
American basswood	<i>Tilia americana</i>
American beech	<i>Fagus grandifolia</i>
Paper birch	<i>Betula papyrifera</i>
Sweet (black) birch	<i>B. lenta</i>

¹⁰ Little, Elbert L., Jr. CHECK LIST OF NATIVE AND NATURALIZED TREES OF THE UNITED STATES (INCLUDING ALASKA). U. S. Dept. Agr., Agr. Handbook 41, 472 pp., 1953.

Yellow birch	<i>B. alleghaniensis</i>
Butternut	<i>Juglans cinerea</i>
Black cherry	<i>Prunus serotina</i>
Elm. spp.	<i>Ulmus spp.</i>
Hackberry	<i>Celtis occidentalis</i>
Hickory	<i>Carya spp.</i>
Red maple	<i>Acer rubrum</i>
Silver maple	<i>A. saccharinum</i>
Sugar maple	<i>A. saccharum</i>
Black oak	<i>Quercus velutina</i>
Northern red oak	<i>Q. rubra</i>
White oak	<i>Q. alba</i>
Balsam poplar (Balm of Gilead)	<i>Populus balsamifera</i>

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Table 1. — *Area of Vermont, by land classes, 1966*

Land class	Area	
	<i>Thousand acres</i>	<i>Percent</i>
Commercial forest land	4,295	73
Unproductive forest land	20	(¹)
Productive-reserved forest land	7	(¹)
Total forest land	4,322	73
Nonforest land ²	1,615	27
All land ³	5,937	100
Total area	6,150	—

Sampling errors for major breakdowns of area for all tables are given in table 11.

¹ Less than 1 percent.

² Includes 19,600 acres of water according to Survey standards of area classification but defined by the Bureau of Census as land.

³ Land area from 1964 Census of Agriculture. Total area less water areas of 40 acres or larger.

Table 2. — *Area of commercial forest land in Vermont,
by ownership classes, 1966*

Ownership class	Area	
	<i>Thousand acres</i>	<i>Percent</i>
National forest	220	5
Other Federal	4	(¹)
State	131	3
County and municipal	44	1
Total public	399	9
Forest industry:		
Pulp and paper	317	7
Lumber	279	7
Other	82	2
Total forest industry	678	16
Farmer-owned ²	1,352	32
Miscellaneous private	1,866	43
All ownerships	4,295	100

¹ Less than 1 percent.

² Estimate based upon sample plots; not from the Census of Agriculture.

Table 3. — *Area of commercial forest land in Vermont, by stand-size and ownership classes, 1966*

(In thousands of acres)

Stand-size class	All owner-ships	Public	Forest industry	Farmer and misc. private
Sawtimber stands	1,768	186	365	1,217
Poletimber stands	1,500	137	218	1,145
Sapling-and-seedling stands	988	75	95	818
Nonstocked areas	39	1	—	38
All classes	4,295	399	678	3,218

Table 4. — *Area of commercial forest land in Vermont, by stand-volume classes for sawtimber and other stand-size classes, 1966*

(In thousands of acres)

Stand volumes per acre ¹	Area by stand-size classes		
	All stands	Sawtimber stands	Other stands
Less than 1,500 board feet	2,425	289	2,136
1,500 to 5,000 board feet	1,625	1,234	391
More than 5,000 board feet	245	245	—
All classes	4,295	1,768	2,527

¹ Net volume, International 1/4-inch rule.

Table 5. — *Area of commercial forest land in Vermont, by stocking classes based on alternative stand components, 1966*

(In thousands of acres)

Stocking class (percentage of normal stocking*)	Stocking classified in terms of—		
	All trees	Growing-stock trees	Desirable trees
90 and up	3,783	1,920	15
80 to 90	229	504	20
70 to 80	104	447	37
60 to 70	57	459	117
50 to 60	28	349	108
40 to 50	28	280	241
30 to 40	27	136	215
20 to 30	21	115	421
10 to 20	—	46	887
Less than 10	18	39	2,234
All areas	4,295	4,295	4,295

* Normal stocking for Vermont has been defined as 60 square feet of basal area per acre.

Table 6. — *Area of commercial forest land in Vermont, by stocking classes of growing-stock trees and by stand-size classes, 1966*

(In thousands of acres)

Stocking class ¹ (percent of normal stocking) ²	All stands	Saw- timber stands	Pole- timber stands	Sapling- and- seedling stands	Non- stocked areas
70 or more	2,871	1,301	1,015	555	—
40 to 70	1,088	396	368	324	—
10 to 40	297	71	117	109	—
Less than 10	39	—	—	—	39
All classes	4,295	1,768	1,500	988	39

¹ In terms of growing-stock trees.

² For definition of normal stocking see table 5.

Table 7. — *Area of commercial forest land in Vermont, by area-condition and ownership classes, 1966*

(In thousands of acres)

Area-condition class ¹	All owner-ships	Public	Forest industry	Farmer and misc. private
1	—	—	—	—
2	16	1	6	9
3	—	—	—	—
4	173	3	31	139
5	1,150	60	154	936
6	1,977	193	374	1,410
7	979	142	113	724
All classes	4,295	399	678	3,218

¹ Area-condition classes are briefly described as follows:

Class 1 — Areas 100 percent or more stocked with desirable trees and not overstocked.

Class 2 — Areas 100 percent or more stocked with desirable trees and overstocked.

Class 3 — Areas 60 to 100 percent stocked with desirable trees, and with less than 30 percent of the area controlled by growing-stock trees, rough and/or rotten trees, inhibiting vegetation, or nonstockable conditions.

Class 4 — Areas 60 to 100 percent stocked with desirable trees, and with more than 30 percent of the area controlled by other trees and/or conditions that prevent occupancy by desirable trees.

Class 5 — Areas less than 60 percent stocked with desirable trees, but with 100 percent or more stocking with growing-stock trees.

Class 6 — Areas less than 60 percent stocked with desirable trees, but with 60 to 100 percent stocking with growing-stock trees.

Class 7 — Areas less than 60 percent stocked with desirable trees, and with less than 60 percent stocking with growing-stock trees.

Table 8. — *Area of commercial forest land in Vermont, by potential growth-per-acre and ownership classes, 1966*

(In thousands of acres)

Growth-per-acre class	All owner-ships	Public	Forest industry	Farmer and misc. private
More than 120 cubic feet	812	29	126	657
85 to 120 cubic feet	811	68	138	605
50 to 85 cubic feet	1,539	159	224	1,156
Less than 50 cubic feet	1,133	143	190	800
All classes	4,295	399	678	3,218

Table 9 — *Area of commercial forest land in Vermont, by forest types and ownership classes, 1966*

(In thousands of acres)

Forest type	All ownerships	Public ownerships	Private ownerships
White-red pine	600	4	596
Spruce-fir	749	26	723
Oak-pine	63	2	61
Oak-hickory	75	6	69
Elm-ash-red maple	555	22	533
Maple-beech-birch	2,004	323	1,681
Aspen-birch	249	16	233
All types	4,295	399	3,896

Table 10. — *Area of noncommercial forest land in Vermont, by forest type, 1966*

(In thousands of acres)

Forest type	All areas	Productive- reserved areas	Unproductive areas
White-red pine	1	1	—
Spruce-fir	14	1	13
Oak-pine	1	—	1
Oak-hickory	—	—	—
Elm-ash-red maple	3	1	2
Maple-beech-birch	4	4	—
Aspen-birch	4	—	4
All types	27	7	20

Table 11. — *Sampling errors, in percent, for major area breakdowns in Vermont, 1966*

Table No.	Area breakdown classification	Sampling error	Table No.	Area breakdown classification	Sampling error
		<i>Percent</i>			<i>Percent</i>
1	Forest land area:		7	Area-condition class:	
	Commercial	1	1		—
	Unproductive	—	2		70
	Total	1	3		—
2	Ownership of commercial forest land*		4		23
	Farmer-owned	6	5		7
	Misc. private	5	6		5
	Farmer and misc. private	2	7		8
3	Stand-size class:		8	Potential growth per-acre class (cubic feet):	
	Sawtimber	5		More than 129	9
	Poletimber	6		85 to 120	9
	Sapling-and-seedling	8		50 to 85	6
	Nonstocked	54		Less than 50	7
4	Stand-volume per acre (board feet):		9	Forest types:	
	Less than 1,500	4		White-red pine	11
	1,500 to 5,000	5		Spruce-fir	10
	More than 5,000	16		Loblolly-shortleaf pine	—
6	Stocking class (percent):			Oak-pine	41
	70 or more	3		Oak-hickory	31
	40 to 70	8		Oak-gum-cypress	—
	10 to 40	16		Elm-ash-red maple	12
	Less than 10	53		Maple-beech-birch	4
				Aspen-birch	18

* There are no sampling errors for areas in public ownership because acreages were obtained from public records, nor for forest industry because acreages were obtained directly.

Table 12. — *Number of growing-stock trees on commercial forest land in Vermont, by diameter classes and by softwoods and hardwoods, 1966*

(In thousands of trees)

D.b.h. class (inches)	All species	Softwood	Hardwood
1.0 to 2.9	803,163	370,787	432,376
3.0 to 4.9	408,768	199,917	208,851
5.0 to 6.9	238,246	105,039	133,207
7.0 to 8.9	142,224	57,484	84,740
9.0 to 10.9	82,126	29,594	52,532
11.0 to 12.9	38,220	12,386	25,834
13.0 to 14.9	21,783	6,864	14,919
15.0 to 16.9	9,778	2,826	6,952
17.0 to 18.9	4,854	1,195	3,659
19.0 to 28.9	4,819	1,295	3,524
29.0 and larger	145	19	126
All classes	1,754,126	787,406	966,720

Table 13. — *Number of rough and/or rotten and growing-stock trees on commercial forest land in Vermont, by diameter groups and by softwoods and hardwoods, 1966*

(In thousands of trees)

D.b.h. class (inches)	All trees ¹	Rough and/or rotten trees	Growing-stock trees
Softwoods:			
5.0 to 8.9	183,220	20,697	162,523
9.0 to 18.9	63,991	11,126	52,865
19.0 and larger	2,113	799	1,314
Total	249,324	32,622	216,702
Hardwoods:			
5.0 to 10.9	341,557	120,835	220,722
11.0 to 18.9	130,188	29,067	101,121
19.0 and larger	9,542	5,892	3,650
Total	481,287	155,794	325,493
All species	730,611	188,416	542,195

¹ Number of salvable dead trees is negligible in Vermont; therefore this item is omitted from this table.

Table 14. — *Volume of timber on commercial forest land in Vermont, by class of timber and by softwoods and hardwoods, 1966*

(In millions of cubic feet)

Class of timber	All species	Softwoods	Hardwoods
Sawtimber trees:			
Sawlog portion	1,470	647	823
Upper-stem portion	268	89	179
Total	1,738	736	1,002
Poletimber trees	2,027	684	1,343
All growing-stock trees	3,765	1,420	2,345
Rough trees:			
Sawtimber size	190	78	112
Poletimber size	116	29	87
Total	306	107	199
Rotten trees:			
Sawtimber size	106	10	96
Poletimber size	55	4	51
Total	161	14	147
Total, all timber	4,232	1,541	2,691

Sampling errors for major breakdowns of timber volume for all tables are given in table 20.

Table 15. — *Volume of growing stock and sawtimber on commercial forest land in Vermont, by ownership classes and by softwoods and hardwoods, 1966*

Ownership class	Growing stock		Sawtimber	
	All species	Softwoods	Hardwoods	All species
	<i>Million cubic feet</i>		<i>Million board feet¹</i>	
Public	356	83	273	765
Forest industry	614	209	405	1,108
Other private	2,795	1,128	1,667	4,728
All ownerships	3,765	1,420	2,345	6,601
			2,627	3,974

¹ International 1/4-inch rule.

Table 16. — *Volume of growing stock and sawtimber on commercial forest land in Vermont, by stand-size classes and by softwoods and hardwoods, 1966*

Stand-size class	Growing stock		Sawtimber	
	All species	Softwoods	Hardwoods	All species
	<i>Million cubic feet</i>		<i>Million board feet¹</i>	
Sawtimber stands	2,065	791	1,274	4,966
Poletimber stands	1,418	471	947	1,352
Sapling-and-seedling stands	281	158	123	279
Nonstocked area	1	—	1	4
Total	3,765	1,420	2,345	6,601
			2,627	3,974

¹ International 1/4-inch rule.

Table 17. — Volume of growing stock on commercial forest land in Vermont, by species and diameter classes, 1966
(In millions of cubic feet)

Species	Diameter class (inches at breast height)													19.0-28.9	29.0-38.9	39.0 and larger
	All classes	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger					
White and red pine ¹	296	61	55	41	33	34	19	13	38	2	—	—	—			
Spruces	496	119	116	95	64	51	25	12	14	—	—	—	—			
Balsam fir	254	90	74	55	22	10	2	1	—	—	—	—	—			
Hemlock	316	68	60	64	43	31	24	15	11	—	—	—	—			
Cedar and tamarack ²	58	24	18	10	3	2	1	—	—	—	—	—	—			
Total softwoods	1,420	362	323	265	165	128	71	41	63	2	—	—	—			
Select white oaks	8	1	1	—	—	1	1	2	2	—	—	—	—			
Select red oaks	77	9	9	10	13	15	8	7	6	—	—	—	—			
Other oaks	8	—	—	3	4	1	—	—	—	—	—	—	—			
Hickory	12	4	4	1	1	1	1	—	—	—	—	—	—			
Yellow birch	299	49	47	55	43	35	27	15	25	3	—	—	—			
Paper birch	227	57	57	50	30	14	9	5	4	—	1	—	—			
Sugar maple	829	144	172	165	112	87	55	36	54	4	—	—	—			
Other maples	276	45	59	69	42	29	15	9	8	—	—	—	—			
Beech	226	29	40	28	36	38	23	15	17	—	—	—	—			
Ash	147	22	28	33	25	18	8	6	6	1	—	—	—			
Black cherry	43	9	11	11	3	3	3	1	2	—	—	—	—			
Aspen	88	18	22	22	10	10	4	1	1	—	—	—	—			
Basswood	21	2	4	5	3	3	—	1	3	—	—	—	—			
Other hardwoods	84	11	18	18	15	6	4	4	6	2	—	—	—			
Total hardwoods	2,345	400	472	470	337	261	158	102	134	10	1	—	—			
All species	3,765	762	795	735	502	389	229	143	197	12	1	—	—			

¹ Includes about 1 percent red pine.

² Includes 4.8 million cubic feet of tamarack.

Table 18. — *Volume of sawtimber on commercial forest land in Vermont, by species and diameter classes, 1966*
(In millions of board feet)¹

Species	Diameter class (inches at breast height)									
	All classes	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger	
White and red pine ²	654	122	118	129	73	53	154	4	1	
Spruces	959	281	237	210	110	55	66	—	—	
Balsam fir	294	162	81	39	9	3	—	—	—	
Hemlock	673	189	151	122	97	66	48	—	—	
Cedar and tamarack ³	47	27	11	6	3	—	—	—	—	
Total softwoods	2,627	781	598	506	292	177	268	4	1	
Select white oaks	31	—	2	5	5	9	10	—	—	
Select red oaks	197	—	42	56	35	35	29	—	—	
Other oaks	18	—	12	6	—	—	—	—	—	
Hickory	10	—	4	3	3	—	—	—	—	
Yellow birch	597	—	143	135	118	72	115	14	—	
Paper birch	238	—	96	55	40	23	22	—	2	
Sugar maple	1,399	—	369	338	244	168	258	21	1	
Other maples	393	—	138	112	64	40	38	1	—	
Beech	519	—	121	149	103	68	78	—	—	
Ash	247	—	80	69	37	27	30	4	—	
Black cherry	50	—	12	13	11	6	8	—	—	
Aspen	100	—	33	40	17	3	7	—	—	
Basswood	37	—	11	12	—	2	12	—	—	
Other hardwoods	138	—	47	22	18	17	27	7	—	
Total hardwoods	3,974	—	1,110	1,015	695	470	634	47	3	
All species	6,601	781	1,708	1,521	987	647	902	51	4	

¹ International 1/4-inch rule.

² Includes about 1 percent red pine.

³ Includes 8.2 million board feet of tamarack.

Table 19. — *Volume of sawtimber on commercial forest land in Vermont, by species and quality classes, 1966*

(In millions of board feet) ¹

Species	All classes	Standard-lumber logs			Other ²
		Grade 1	Grade 2	Grade 3	
Softwoods:					
White and red pines	654	17	93	337	207
Other softwoods ³	1,973	—	—	—	—
Total	2,627	17	93	337	207
Hardwoods					
Select white and red oaks	228	47	68	90	23
Other oaks	18	1	3	11	3
Hickory	10	—	2	3	5
Yellow birch	597	89	201	275	32
Paper birch	238	20	70	121	27
Sugar maple	1,399	206	395	647	151
Other maples	393	19	116	193	65
Beech	519	19	128	322	50
Ash	247	59	72	78	38
Black cherry	50	7	12	21	10
Basswood	38	4	8	17	9
Other hardwoods	237	23	51	137	26
Total	3,974	494	1,126	1,915	439
All species	6,601	511	1,219	2,252	—

¹ International 1/4-inch rule.

² For white and red pines "Other" is Grade 4, for hardwoods "Other" is Tie and Timber Log Grade. For a discussion of log grade see the appendix.

³ Other softwoods were not graded.

Includes about 1 million board feet of tamarack.
Includes 925 million board feet of tamarack.

Table 20. — *Sampling errors, in percent, for major timber volume breakdowns in Vermont, 1966*

Table No.	Volume breakdown classification	Sampling error	Table No.	Volume breakdown classification	Sampling error	
					Cubic feet	Board feet
		<i>Percent</i>			<i>Percent</i>	
14	Class of timber (cubic feet):		17-18	Species:		
	Softwood growing stock	5		White and red pine	14	16
	Hardwood growing stock	3		Spruce	9	13
	Sawtimber trees	3		Balsam fir	11	17
	Poletimber trees	3		Hemlock	11	12
	All growing stock	2		Cedar	25	31
	Rough trees	5		Select white oaks	57	69
	Rotten trees	5		Select red oaks	20	26
	All live trees	2		Chestnut	68	66
15	Ownership classes:			Yellow birch	8	10
	<i>Growing stock (cubic feet)</i>			Hickory	32	69
	Other public	5		Soft maples	9	11
	Forest industry	11		Beech	9	10
	Farmer and misc. private	3		Paper birch	10	17
	<i>Sawtimber (board feet)</i>			Hard maple	6	7
	Other public	5		Ash, walnut, cherry	12	20
	Forest industry	13		Aspen	17	23
	Farmer and misc. private	4		Other hardwoods	15	20
	Softwood sawtimber	6		Basswood	25	30
	Hardwood sawtimber	4				
	All sawtimber	2	17-18	Diameter class (inches):		
16	Stand-size classes:			5.0 to 6.9	4	—
	<i>Growing stock (cubic feet)</i>			7.0 to 8.9	4	—
	Sawtimber stands	5		9.0 to 10.9 ¹	3	7
	Poletimber stands	7		11.0 to 12.9	4	4
	Sapling-and-seedling	12		13.0 to 14.9	5	4
	Nonstocked	45		15.0 to 16.9	6	5
	<i>Sawtimber (board feet)</i>			17.0 to 18.9	7	6
	Sawtimber stands	3		19.0 to 28.9	8	7
	Poletimber stands	9		29.0 and larger	24	23
	Sapling-and-seedling	15				
	Nonstocked	52				

¹ Board-foot sampling error for this class is for softwoods only.

Table 21. — *Average net annual growth and annual cut of growing stock and sawtimber on commercial forest land in Vermont, by species, 1948-1965*

Species	Growing stock		Sawtimber	
	Net annual growth	Annual timber cut	Net annual growth	Annual timber cut
	<i>Thousand cubic feet</i>		<i>Thousand board feet¹</i>	
Softwoods:				
White and red pine	12,284	6,030	34,204	33,090
Spruce and fir	18,006	10,207	36,000	44,766
Hemlock and other softwoods	9,010	10,263	21,396	51,280
Total	39,300	26,500	91,600	129,136
Hardwoods:				
Oaks	2,554	1,712	7,700	4,818
Yellow birch	2,781	9,015	6,268	31,095
Hard maple	18,203	9,772	38,905	26,717
Soft maples	4,025	2,633	10,024	2,362
Ash	2,104	1,188	6,305	3,592
Other hardwoods	14,033	10,380	13,898	28,198
Total	43,700	34,700	83,100	96,682
All species	83,000	61,200	174,700	225,818

¹ International 1/4-inch rule.

Sampling errors for tables 21 through 26(B) are shown in table 27.

Table 22. — *Average net annual growth and annual cut of growing stock on commercial forest land in Vermont, by ownership classes and by softwoods and hardwoods, 1948-1965*
(In thousands of cubic feet)

Ownership class	Net annual growth			Annual timber cut		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
Public	4,400	1,300	3,100	3,900	600	3,300
Forest industry	15,700	8,500	7,200	6,100	2,100	4,000
Farmer and misc. private	62,900	29,500	33,400	51,200	23,800	27,400
All ownerships	83,000	39,300	43,700	61,200	26,500	34,700

Table 23. — *Average net annual growth and annual cut of sawtimber on commercial forest land in Vermont, by ownership classes and by softwoods and hardwoods, 1948-1965*
(In thousands of board feet)¹

Ownership class	Net annual growth			Annual timber cut		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
Public	10,800	3,900	6,900	9,165	2,537	6,628
Forest industry	19,600	4,100	15,500	24,059	10,689	13,370
Farmer and misc. private	144,300	83,600	60,700	192,594	115,910	76,684
All ownerships	174,700	91,600	83,100	225,818	129,136	96,682

¹ International 1/4-inch rule.

Table 24. — *Components of average net annual growth¹ of growing stock and sawtimber on commercial forest land in Vermont, by species group, 1948-1965*

Components	All species	Softwoods	Hardwoods
GROWING STOCK			
<i>Thousand cubic feet</i>			
Gross growth	109,200	49,300	59,900
Annual mortality	26,200	10,000	16,200
Net annual growth of growing stock	83,800	39,300	43,700
SAWTIMBER			
<i>Thousand board feet²</i>			
Gross growth	220,700	110,100	110,600
Annual mortality	46,000	18,500	27,500
Net annual growth sawtimber	174,700	91,600	83,100

¹ Including growth on trees that were cut.

² International 1/4-inch rule.

Table 25. — *Average annual mortality of growing stock and sawtimber on commercial forest land in Vermont, by species, 1948-1965*

Species	Growing stock	Sawtimber
	<i>Thousand cubic feet</i>	<i>Thousand board feet¹</i>
Softwoods:		
White and red pine	940	1,006
Spruce and balsam fir	7,235	13,194
Other softwoods	1,830	4,254
Total	10,005	18,454
Hardwoods:		
Select oaks	115	547
Other oaks	228	486
Yellow birch	2,551	2,486
Paper birch	2,372	4,995
Sugar maple	3,065	6,085
Soft maple	1,561	1,156
Ash	1,203	2,086
Other hardwoods	5,117	9,686
Total	16,212	27,527
All species	26,217	45,981

¹ International 1/4-inch rule.

Table 26 (A). — *Average annual mortality of growing stock and sawtimber on commercial forest land in Vermont, by ownership classes and by softwoods and hardwoods, 1948-1965*

Ownership	Growing stock			Sawtimber	
	All species	Softwoods	Hardwoods	All species	Hardwoods
	<i>Thousand cubic feet</i>			<i>Thousand board feet¹</i>	
Public	3,654	1,755	1,899	8,887	4,200
Forest industry	4,348	1,795	2,553	7,675	2,397
Farmer and misc. private	18,215	6,455	11,760	29,419	11,857
All ownerships	26,217	10,005	16,212	45,981	18,454

¹ International 1/4-inch rule.

Table 26 (B). — *Average annual mortality of growing stock and sawtimber on commercial forest land in Vermont, by causes and by softwoods and hardwoods, 1948-1965*

Cause of death	Growing stock			Sawtimber	
	All species	Softwoods	Hardwoods	All species	Hardwoods
	<i>Thousand cubic feet</i>			<i>Thousand board feet¹</i>	
Fire	—	—	—	—	—
Insects	437	198	239	1,357	125
Diseases	13,776	3,428	10,348	21,360	8,257
Other	4,260	1,612	2,648	8,804	2,853
Unknown	7,744	4,767	2,977	14,460	7,219
All causes	26,217	10,005	16,212	45,981	18,454

¹ International 1/4-inch rule.

Table 27. — *Sampling errors, in percent, for major breakdowns of average annual growth, cut, and mortality of growing stock and sawtimber, in Vermont, 1948-1965*

Table No.	Breakdown classification	Sampling error	Table No.	Breakdown classification	Sampling error
		Percent			Percent
21	Growth in cubic feet:		23	Growth in board feet:	
	Softwoods	20		Public	*
	Hardwoods	33		Forest industry	54
	All species	25		Farmer and misc. private	26
	Cut in cubic feet:			Cut in board feet:	
	Softwoods	23		Public	53
	Hardwoods	21		Forest industry	56
	All species	15		Farmer and misc. private	20
	Growth in board feet:				
	Softwoods	26			Cubic feet
	Hardwoods	40			Board feet
	All species	24			Percent
	Cut in board feet:		25	Mortality by species group:	
	Softwoods	25		Softwoods	19 22
	Hardwoods	23		Hardwoods	13 21
	All species	17		All species	11 16
22	Growth in cubic feet:		26 (A)	Mortality by owner:	
	Public	*		Public	31 40
	Forest industry	66		Forest industry	37 52
	Farmer and misc. private	27		Farmer and misc. private	13 21
	Cut in cubic feet:		26 (B)	Mortality by cause:	
	Public	53		Fire	— —
	Forest Industry	55		Insect	64 91
	Farmer and misc. private	17		Disease	15 22
				Other	25 35
				Unknown	23 29

* There are no sampling errors for areas in public ownership because acreages were obtained from public records, nor for forest industry because acreages were obtained directly.

Table 28. — *Total output of timber products, by products, by type of material used, and by softwoods and hardwoods, in Vermont, 1965*

Product and species group	Total output in standard units		Output from roundwood		Output from plant byproducts:
	Unit	Number	Standard units	M cubic feet	Standard units
Sawlogs:					
Softwood	M board feet ¹	49,736	49,736	8,883	—
Hardwood	M board feet ¹	65,464	65,464	10,754	—
Total	M board feet ¹	115,200	115,200	19,637	—
Veneer logs:					
Softwood	M board feet	—	—	—	—
Hardwood	M board feet	15,032	15,032	2,469	—
Total	M board feet	15,032	15,032	2,469	—
Pulpwood:					
Softwood	Standard cords ²	93,100	87,000	6,960	6,100
Hardwood	Standard cords ²	57,000	26,000	2,080	31,000
Total	Standard cords ²	150,100	113,000	9,040	37,100
Poles:					
Softwood	M pieces	12	12	23	—
Hardwood	M pieces	—	—	—	—
Total	M pieces	12	12	23	—
Misc. Industrial wood: ³					
Softwood	M cubic feet	293	293	293	—
Hardwood	M cubic feet	4,531	4,531	4,531	—
Total	M cubic feet	4,824	4,824	4,824	—

CONTINUED

Table 28. — *continued*

Product and species group	Total output in standard units		Output from roundwood		Output from plant byproducts:	
	Unit	Number	Standard units	M cubic feet	Standard units	Standard units
Posts (round and split):						
Softwood	M pieces	62	62	45	—	—
Hardwood	M pieces	12	12	8	—	—
Total	M pieces	74	74	53	—	—
Fuelwood:						
Softwood	Standard cords	6,462	—	—	6,462	—
Hardwood	Standard cords	78,370	73,420	5,874	—	4,950
Total	Standard cords	84,832	73,420	5,874	—	11,412
All products:						
Softwood	M cubic feet	17,209	16,204	16,204	1,005	—
Hardwood	M cubic feet	28,592	25,716	25,716	2,876	—
Total	M cubic feet	45,801	41,920	41,920	3,881	—

¹ International 1/4-inch rule.² Rough wood basis (for example, chips converted to equivalent standard cords).³ Includes hewn ties, excelsior bolts, hinge bolts, turnery bolts, chemical wood, and the like.

Table 29. — *Total output of roundwood products, by source and by softwoods and hardwoods, in Vermont, 1965*

(In thousands of cubic feet)

Source	All species	Softwoods	Hardwoods
Growing-stock trees ¹			
Sawtimber	25,977	12,404	13,573
Poletimber	9,891	2,634	7,257
Total	35,868	15,038	20,830
Rough and/or rotten trees ¹	1,257	117	1,140
Salvable dead trees ¹	1,137	22	1,115
Other sources ²	3,658	1,027	2,631
All sources	41,920	16,204	25,716

¹ On commercial forest land.

² Includes noncommercial forest land, nonforest land like fence rows, trees less than 5.0 inches in diameter, and tree tops and limbs.

Table 30. — *Timber cut from growing stock on commercial forest land, by products and logging residues, and by softwoods and hardwoods, in Vermont, 1965*

(In thousands of cubic feet)

Products and residues	All species	Softwoods	Hardwoods
Roundwood products:			
Sawlogs	18,027	8,238	9,789
Veneer logs and bolts	2,340	—	2,340
Cooperage logs and bolts	—	—	—
Pulpwood	8,311	6,464	1,847
Piling	—	—	—
Poles	22	22	—
Mine timbers	—	—	—
Misc. industrial wood	4,295	272	4,023
Posts	49	42	7
Fuelwood	2,824	—	2,824
All products	35,868	15,038	20,830
Logging residues	6,323	1,692	4,631
Timber cut	42,191	16,730	25,461

Table 31. — *Timber cut from live sawtimber on commercial forest land, by products and logging residues, and by softwoods and hardwoods, Vermont, 1965*

(In thousands of board feet) ¹

Products and residues	All species	Softwoods	Hardwoods
Roundwood products:			
Sawlogs	85,065	34,670	50,395
Veneer logs and bolts	12,046	—	12,046
Cooperage logs and bolts	—	—	—
Pulpwood	16,419	15,213	1,206
Piling	—	—	—
Poles	89	89	—
Mine timbers	—	—	—
Misc. industrial wood	3,269	641	2,628
Posts	101	98	3
Fuelwood	2,528	—	2,528
All products	119,517	50,711	68,806
Logging residues	10,203	2,554	7,649
Timber cut	129,720	53,265	76,455

¹ International 1/4-inch rule.

Table 32. — *Volume of plant residues, by industrial source and type of residue, and by softwoods and hardwoods, in Vermont, 1965*
(In thousands of cubic feet)

Industrial source	Species and character of residues							
	All species			Softwoods			Hardwoods	
	Total	Coarse ¹	Fine ²	Total	Coarse	Fine	Total	Fine
Lumber industry	3,337	2,070	1,267	497	16	481	2,840	786
Other primary industries	828	259	569	43	14	29	785	540
All industries	4,165	2,329	1,836	540	30	510	3,625	1,326

¹ Unused material suitable for chipping, like slabs, edgings, and veneer cores.

² Unused material not suitable for chipping, like sawdust and shavings.

Table 33. — *Timber growth projections for Vermont, 1966-1996*

Species group	1966 (Inventory year)	1976	1986	1996
GROWING STOCK <i>Thousand cubic feet</i>				
Softwoods:				
Cut	19,600	15,500	15,500	15,500
Growth	46,500	55,700	66,000	77,800
Inventory	1,427,600	1,756,800	2,209,100	2,778,700
Hardwoods:				
Cut	22,200	19,300	19,300	19,300
Growth	46,900	49,600	53,000	56,600
Inventory	2,346,500	2,619,200	2,939,800	3,295,400
All species:				
Cut	41,800	34,800	34,800	34,800
Growth	93,400	105,300	119,000	134,400
Inventory	3,774,100	4,376,000	5,148,900	6,074,100
SAWTIMBER <i>Thousand board feet²</i>				
Softwoods:				
Cut	59,000	45,000	45,000	45,000
Growth	107,000	132,000	168,000	212,400
Inventory	2,653,000	3,306,000	4,330,000	5,744,000
Hardwoods:				
Cut	60,000	50,000	50,000	50,000
Growth	90,000	101,500	116,800	134,000
Inventory	3,974,000	4,370,000	4,950,000	5,687,000
All species:				
Cut	119,000	95,000	95,000	95,000
Growth	197,000	234,000	285,200	347,200
Inventory	6,627,000	7,675,000	9,280,000	11,431,000

¹ For a discussion of the assumptions used in this projection see section "Timber Supply Outlook."

² International 1/4-inch rule.

Table 34. — *Land area of Vermont, by land classes and geographic units, 1966*
(In thousands of acres)

Land class	Northern ¹	Southern ²	National forest	State forests	Total
Commercial forest land	2,072.1	1,919.3	219.9	83.3	4,294.6
Unproductive forest land	3.5	1.8	7.2	7.7	20.2
Productive-reserved forest land	2.2	.4	2.3	2.0	6.9
Total forest land	2,077.8	1,921.5	229.4	93.0	4,321.7
Nonforest land	754.7	804.1	3.1	3.7	1,614.9 ³
All land	2,832.5	2,725.6	232.5	96.7	5,936.6
<i>Sampling errors, in percent</i>					
Commercial forest land	2	2	—	—	1

¹ Includes Caledonia, Essex, Franklin, Lamoille, Orange, Orleans, and Washington Counties, but excludes areas of State forests and National forest.

² Includes Addison, Bennington, Chittenden, Rutland, Windham, and Windsor Counties, but excludes areas of State forests and National forest.

³ Includes 49,000 acres in Grand Isle County, which was not sampled.

Table 35. — *Area of commercial forest land in Vermont by ownership classes and geographic units, 1966*
(In thousands of acres)

Ownership class	Northern	Southern	National forest	State forests	Total
National forest	—	—	219.9	—	219.9
Other Federal	0.8	2.9	—	—	3.7
State	12.2	36.1	—	83.3	131.6
County and municipal	19.2	24.5	—	—	43.7
Total public	32.2	63.5	219.9	83.3	398.9
Pulp and paper industry	233.8	83.0	—	—	316.8
Lumber industry	189.1	90.4	—	—	279.5
Other forest industry	40.0	42.0	—	—	82.0
Total forest industry	462.9	215.4	—	—	678.3
Farmer-owned	784.4	567.2	—	—	1,351.6
Misc. private	792.6	1,073.2	—	—	1,865.8
All ownerships	2,072.1	1,919.3	219.9	83.3	4,294.6
<i>Sampling errors, in percent ¹</i>					
Forest industry	11	19	—	—	10
Farmer-owned	8	10	—	—	6
Misc. private	8	6	—	—	5

¹ No sampling errors for area in public ownership. Areas were obtained from records.

Table 36. — *Area of commercial forest land in Vermont, by stand-size classes and geographic units, 1966*
(In thousands of acres)

Stand-size class	Northern	Southern	National forest	State forests	Total
Sawtimber	825.5	786.5	122.2	33.6	1,767.8
Poletimber stands	660.8	748.2	61.4	29.4	1,499.8
Sapling-and-seedling stands	547.9	384.6	36.3	19.5	988.3
Nonstocked areas	37.9	—	—	.8	38.7
All classes	2,072.1	1,919.3	219.9	83.3	4,294.6

<i>Sampling errors, in percent</i>					
Sawtimber stands	7	8	9	8	5
Poletimber stands	9	8	19	9	6
Sapling-and-seedling stands	11	14	23	20	8
Nonstocked areas	57	—	—	40	54
All classes	2	2	—	1	1

Table 37. — *Area of commercial forest land in Vermont, by stocking classes of growing-stock trees and geographic units, 1966*
(In thousands of acres)

Stocking percentage class	Northern	Southern	National forest	State forests	Total
70 percent or more	1,456.6	1,242.3	116.3	56.3	2,871.5
40 to 70 percent	426.4	554.2	86.4	20.5	1,087.5
10 to 40 percent	151.2	122.8	17.2	5.7	296.9
Less than 10 percent	37.9	—	—	.8	38.7
All classes	2,072.1	1,919.3	219.9	83.3	4,294.6

Table 38. — *Area of Commercial forest land in Vermont, by area-condition classes and geographic units, 1966*
(In thousands of acres)

Area-condition class ¹	Northern	Southern	National forest	State forests	Total
1	—	—	—	—	—
2	15.1	—	—	0.5	15.6
3	—	—	—	—	—
4	139.8	30.8	—	2.6	173.2
5	524.9	577.3	28.0	19.8	1,150.0
6	918.0	911.5	119.7	27.4	1,976.6
7	474.3	399.7	72.2	33.0	979.2
All classes	2,072.1	1,919.3	219.9	83.3	4,294.6

¹ See table 7 for description of area-condition classes.

Table 39. — *Area of commercial forest land in Vermont, by forest types and geographic units, 1966*
(In thousands of acres)

Forest type	Northern	Southern	National forest	State forests	Total
White-red pine	270.9	324.4	2.3	2.2	599.8
Spruce-fir	570.7	152.4	18.0	8.0	749.1
Oak-pine	8.2	52.0	—	2.5	62.7
Oak-hickory	9.2	60.2	4.7	.9	75.0
Elm-ash-red maple	225.6	318.7	5.0	5.7	555.0
Maple-beech-birch	882.3	884.0	180.9	57.2	2,004.4
Aspen-paper birch	105.2	127.6	9.0	6.8	248.6
All types	2,072.1	1,919.3	219.9	83.3	4,294.6

Sampling errors, in percent

White-red pine	18	14	100	45	11
Spruce-fir	11	24	36	23	10
Oak-pine	100	47	—	40	41
Oak-hickory	100	36	70	71	31
Elm-ash-red maple	20	16	72	28	12
Maple-beech-birch	7	7	5	5	4
Aspen-paper birch	27	27	49	25	18

Table 40. — *Volume of timber on commercial forest land in Vermont, by class of timber and geographic units, 1966*
(In millions of cubic feet)

Class of timber	Northern	Southern	National forest	State forests	Total
Sawtimber trees:					
Sawlog portion	674.2	668.8	91.6	35.5	1,470.1
Upper-stem portion	117.8	125.1	18.3	6.7	267.9
Total	792.0	793.9	109.9	42.2	1,738.0
Poletimber trees	964.8	929.1	88.6	44.7	2,027.2
All growing-stock trees	1,756.8	1,723.0	198.5	86.9	3,765.2
Rough trees:					
Sawtimber size	75.5	102.4	11.1	.3	189.3
Poletimber size	48.7	55.7	10.1	1.7	116.2
Total	124.2	158.1	21.2	2.0	305.5
Rotten trees:					
Sawtimber size	50.7	37.2	12.7	5.1	105.7
Poletimber size	24.9	20.8	4.9	5.2	55.8
Total	75.6	58.0	17.6	10.3	161.5
Total, all timber	1,956.6	1,939.1	237.3	99.2	4,232.2
<i>Sampling errors, in percent</i>					
Sawtimber trees	5	5	6	6	3
Poletimber trees	4	4	8	6	3
All growing-stock trees	3	3	3	4	2
Rough trees	8	7	8	13	5
Rotten trees	7	8	8	7	5

Table 41. — *Volume of growing stock on commercial forest land in Vermont, by ownership classes, softwoods and hardwoods, and geographic units, 1966*
(In millions of cubic feet)

Ownership and species group	Northern	Southern	Other	Total
National forest:				
Softwoods	—	—	39.4	39.4
Hardwoods	—	—	159.1	159.1
Total	—	—	198.5	198.5
State forests				
Softwoods	—	—	25.0	25.0
Hardwoods	—	—	61.9	61.9
Total	—	—	86.9	86.9
Other public:				
Softwoods	6.1	12.0	—	18.1
Hardwoods	17.7	35.0	—	52.7
Total	23.8	47.0	—	70.8
Forest Industry:				
Softwoods	179.4	29.6	—	209.0
Hardwoods	276.3	128.7	—	405.0
Total	455.7	158.3	—	614.0
Other private:				
Softwoods	645.9	482.3	—	1,128.2
Hardwoods	631.4	1,035.4	—	1,666.8
Total	1,277.3	1,517.7	—	2,795.0
All ownerships:				
Softwoods	831.4	523.9	64.4	1,419.7
Hardwoods	925.4	1,199.1	221.0	2,345.5
Total	1,756.8	1,723.0	285.4	3,765.2
<i>Sampling errors, in percent</i>				
National forest	—	—	3	3
State forests	—	—	4	4
Other public	**	49	—	46
Forest industry	13	21	—	11
Other private	6	4	—	3

** Over 100 percent sampling error.

Table 42. — *Volume of sawtimber on commercial forest land in Vermont, by ownership classes, softwoods and hardwoods, and geographic units, 1966*
(In millions of cubic feet)

Ownership and species group	Northern	Southern	Other	Total
National forest:				
Softwoods	—	—	71.7	71.7
Hardwoods	—	—	402.7	402.7
Total	—	—	474.4	474.4
State forests:				
Softwoods	—	—	58.4	58.4
Hardwoods	—	—	116.0	116.0
Total	—	—	174.4	174.4
Other public:				
Softwoods	14.6	28.8	—	43.4
Hardwoods	24.4	48.2	—	72.6
Total	39.0	77.0	—	116.0
Forest industry:				
Softwoods	334.3	43.2	—	377.5
Hardwoods	486.3	244.0	—	730.3
Total	820.6	287.2	—	1,107.8
Other private:				
Softwoods	1,059.9	1,015.7	—	2,075.6
Hardwoods	970.1	1,682.0	—	2,652.1
Total	2,030.0	2,697.7	—	4,727.7
All ownerships:				
Softwoods	1,408.8	1,087.7	130.1	2,626.6
Hardwoods	1,480.8	1,974.2	518.7	3,973.7
Total	2,889.6	3,061.9	648.8	6,600.3
<i>Sampling errors, in percent</i>				
National forest	—	—	4	4
State forests	—	—	6	6
Other public	**	52	—	51
Forest industry	15	24	—	13
Other private	7	4	—	4

** Over 100 percent sampling error.

Table 43. — *Volume of growing stock on commercial forest land in Vermont, by stand-size classes, softwoods and hardwoods, and geographic units, 1966*
(In millions of cubic feet)

Standard-size class and species group	Northern	Southern	National forest	State forests	Total
Sawtimber stands:					
Softwoods	450.2	311.1	16.0	14.1	791.4
Hardwoods	500.2	630.0	110.6	32.9	1,273.7
Total	950.4	941.1	126.6	47.0	2,065.1
Poletimber stands:					
Softwoods	286.0	154.8	21.9	8.1	470.8
Hardwoods	374.8	507.0	39.8	25.7	947.3
Total	660.8	661.8	61.7	33.8	1,418.1
Other stands:					
Softwoods	95.2	58.0	1.5	2.8	157.5
Hardwoods	50.4	62.1	8.7	3.3	124.5
Total	145.6	120.1	10.2	6.1	282.0
All stands:					
Softwoods	831.4	523.9	39.4	25.0	1,419.7
Hardwoods	925.4	1,199.1	159.1	61.9	2,345.5
Total	1,756.8	1,723.0	198.5	86.9	3,765.2
<i>Sampling errors, in percent</i>					
Sawtimber stands	8	7	10	9	5
Poletimber stands	10	10	19	12	7
Other stands	17	19	29	22	12
All stands:					
Softwoods	7	8	20	15	5
Hardwoods	6	4	6	5	3
Total	3	3	4	4	2

Table 44. — *Volume of sawtimber on commercial forest land in Vermont, by stand-size classes, softwoods and hardwoods, and geographic units, 1966*
(In millions of board feet)

Stand-size class and species group	Northern	Southern	National forest	State forests	Total
Sawtimber stands:					
Softwoods	1,051.8	818.3	51.8	43.7	1,965.6
Hardwoods	1,120.3	1,461.0	331.9	86.7	2,999.9
Total	2,172.1	2,279.3	383.7	130.4	4,965.5
Poletimber stands:					
Softwoods	285.0	188.0	19.5	11.1	503.6
Hardwoods	317.3	452.0	53.3	25.8	848.4
Total	602.3	640.0	72.8	36.9	1,352.0
Other stands:					
Softwoods	72.0	81.4	4.4	3.6	157.4
Hardwoods	43.2	61.2	17.5	3.5	125.4
Total	115.2	142.6	17.9	7.1	282.8
All stands:					
Softwoods	1,408.8	1,087.7	71.7	58.4	2,626.6
Hardwoods	1,480.8	1,974.2	402.7	116.0	3,973.7
Total	2,889.6	3,061.9	474.4	174.4	6,600.3

Sampling errors, in percent

Sawtimber stands	5	5	7	10	3
Poletimber stands	14	14	26	13	9
Other stands	22	23	37	26	15
All stands:					
Softwoods	8	10	25	14	6
Hardwoods	8	6	6	7	4
Total	3	3	4	6	2

Table 45. — *Volume of growing stock on commercial forest land in the Northern geographic unit, in Vermont, by species and diameter classes, 1966*
(In millions of cubic feet)

Species	Diameter class (inches at breast height)									
	All classes	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 28.9	29.0 and larger
White and red pines	110.0	21.1	16.3	15.0	11.9	9.9	6.2	5.5	22.6	1.5
Spruces	312.4	73.1	85.5	61.3	36.0	29.9	13.9	6.3	6.4	—
Balsam fir	218.6	76.7	60.5	49.5	20.3	9.5	1.5	.6	—	—
Hemlock	135.1	25.8	25.8	28.1	18.0	13.5	11.5	6.5	5.9	—
Other softwoods ¹	55.3	23.4	17.5	9.1	2.9	1.5	.9	—	—	—
Total softwoods	831.4	220.1	205.6	163.0	89.1	64.3	34.0	18.9	34.9	1.5
Red oak	—	—	—	—	—	—	—	—	—	—
White oak	—	—	—	—	—	—	—	—	—	—
Yellow birch	147.1	20.1	19.1	29.4	17.4	22.2	14.5	7.3	14.8	2.3
Paper birch	78.2	21.9	27.2	12.8	9.5	4.6	1.6	.6	—	—
Sugar maple	370.0	65.3	79.8	72.6	47.9	36.1	26.4	14.8	24.9	2.2
Soft maple	105.9	16.7	23.9	30.6	13.1	9.5	6.0	3.6	2.5	—
Beech	93.6	7.5	18.6	12.0	14.5	18.8	11.4	5.4	5.4	—
Ash	46.5	7.8	10.9	12.7	7.7	2.5	3.4	.4	.7	.4
Aspen	38.0	10.4	8.6	7.7	4.0	6.4	.9	—	—	—
Other hardwoods	46.1	5.9	8.5	9.2	7.6	4.5	2.7	2.3	5.4	—
Total hardwoods	925.4	155.6	196.6	187.0	121.7	104.6	66.9	34.4	53.7	4.9
All species	1,756.8	375.7	402.2	350.0	210.8	168.9	100.9	53.3	88.6	6.4

¹ Mostly northern white cedar.

Table 46. — *Volume of growing stock on commercial forest land in the Southern geographic unit, in Vermont, by species and diameter classes, 1966*

(In millions of cubic feet)

Species	Diameter class (inches at breast height)										19.0- 28.9	29.0 and larger
	All classes	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 28.9	29.0 and larger		
White and red pines	180.8	38.4	37.4	25.4	20.6	23.9	12.3	7.9	14.7	0.2		
Spruces ¹	171.4	45.3	30.8	32.5	25.3	17.3	9.3	4.9	6.0	—		
Balsam fir	—	—	—	—	—	—	—	—	—	—		
Hemlock	171.7	41.2	32.5	34.8	22.7	16.5	11.5	8.0	4.5	—		
Other softwoods	—	—	—	—	—	—	—	—	—	—		
Total softwoods	523.9	124.9	100.7	92.7	68.6	57.7	33.1	20.8	25.2	.2		
Red oak	72.4	9.4	8.8	8.9	12.6	13.2	7.7	6.8	5.0	—		
White oak	15.8	.4	1.0	2.6	4.1	2.6	1.0	2.1	2.0	—		
Yellow birch	106.9	23.1	20.3	18.9	18.9	8.6	6.3	4.6	5.3	.9		
Paper birch	131.3	31.6	25.2	33.4	17.0	8.5	7.0	3.8	4.3	.5		
Sugar maple	366.5	69.1	77.8	74.8	48.4	35.7	18.7	17.7	22.2	2.1		
Soft maples	152.4	26.6	32.2	34.8	24.4	17.7	8.0	4.5	4.2	—		
Beech	107.8	18.3	17.9	12.5	17.4	15.0	8.8	7.8	10.1	—		
Ash	88.1	13.4	16.7	18.8	14.3	11.8	3.3	4.6	4.7	.5		
Aspen	47.2	6.8	13.5	13.5	5.6	3.4	2.6	.7	1.1	—		
Other hardwoods	110.7	19.9	28.0	25.3	14.4	8.4	4.4	3.5	5.2	1.6		
Total hardwoods	1,199.1	218.6	241.4	243.5	177.1	124.9	67.8	56.1	64.1	5.6		
All species	1,723.0	343.5	342.1	336.2	245.7	182.6	100.9	76.9	89.3	5.8		

¹ Includes 18.5 million cubic feet of balsam fir and a negligible amount of other softwoods.

Table 47. — *Volume of growing stock on commercial forest land in the National forest geographic unit, in Vermont, by species and diameter classes, 1966*

(In millions of cubic feet)

Species	Diameter class (inches at breast height)										
	All classes	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 28.9	29.0 and larger	
White and red pines	—	—	—	—	—	—	—	—	—	—	
Spruces ¹	21.3	5.4	4.2	4.0	2.3	2.6	1.4	0.2	1.2	—	
Balsam fir	—	—	—	—	—	—	—	—	—	—	
Hemlock	—	—	—	—	—	—	—	—	—	—	
Other softwoods	18.1	5.9	6.3	1.7	1.5	.8	.8	.4	.7	—	
Total softwoods	39.4	11.3	10.5	5.7	3.8	3.4	2.2	.6	1.9	—	
Red oak	—	—	—	—	—	—	—	—	—	—	
White oak	—	—	—	—	—	—	—	—	—	—	
Yellow birch	32.6	4.8	4.8	4.9	4.7	2.6	4.7	2.8	3.3	—	
Paper birch	11.2	2.5	2.9	2.4	1.8	.6	.3	.5	.2	—	
Sugar maple	67.7	4.6	8.5	12.9	12.3	12.6	8.2	2.9	5.4	.3	
Soft maples	12.7	1.7	2.2	2.4	3.3	1.0	.6	.3	1.0	.2	
Beech	18.4	2.5	2.1	2.3	3.1	3.6	2.6	1.1	1.1	—	
Ash	8.8	.5	.2	.7	1.7	3.1	1.4	.7	.5	—	
Aspen	—	—	—	—	—	—	—	—	—	—	
Other hardwoods	7.7	.3	1.7	1.9	1.1	1.3	.7	.2	.5	—	
Total hardwoods	159.1	16.9	22.4	27.5	28.0	24.8	18.5	8.5	12.0	.5	
All species	198.5	28.2	32.9	33.2	31.8	28.2	20.7	9.1	13.9	.5	

¹ Includes a negligible amount of balsam fir.

Table 48. — *Volume of growing stock on commercial forest land in the State forests geographic unit, in Vermont, by species and diameter classes, 1966*

Species	(In millions of cubic feet)										
	Diameter class (inches at breast height)										
All classes	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-28.9	29.0 and larger		
White and red pines	—	—	—	—	—	—	—	—	—		
Spruces ¹	11.1	1.9	2.1	2.1	1.5	0.8	0.3	0.3	—		
Balsam fir	—	—	—	—	—	—	—	—	—		
Hemlock	—	—	—	—	—	—	—	—	—		
Other softwoods	13.9	3.5	3.7	1.9	1.2	.8	.5	.7	.1		
Total softwoods	25.0	5.4	5.8	4.0	2.7	1.6	.8	1.0	.1		
Red oak	—	—	—	—	—	—	—	—	—		
White oak	—	—	—	—	—	—	—	—	—		
Yellow birch	12.6	1.2	2.3	2.1	1.5	1.1	.8	1.3	.2		
Paper birch	6.6	1.5	1.6	.9	.4	.2	.1	—	—		
Sugar maple	24.6	4.6	5.2	3.2	2.3	2.2	.9	1.8	—		
Soft maples	4.9	.5	1.1	1.1	.7	.3	.2	.1	—		
Beech	6.6	.9	.7	1.3	1.0	.8	.5	.3	—		
Ash	3.2	.4	.3	.7	.2	.2	.3	.2	—		
Aspen	—	—	—	—	—	—	—	—	—		
Other hardwoods	3.4	.2	.8	.4	.6	.2	.2	.1	—		
Total hardwoods	61.9	9.3	12.0	9.7	6.7	5.0	3.0	3.8	.2		
All species	86.9	14.7	17.8	13.3	9.4	6.6	3.8	4.8	.3		

¹ Includes a negligible amount of balsam fir.

Table 49. — *Sampling errors for growing stock on commercial forest land, in Vermont, by species and geographic units, 1966*

Species	Northern	Southern	National forest	State forests	Total
White and red pines	27	16	—	—	14
Spruces	11	16	20	19	9
Balsam fir	12	—	—	—	11
Hemlock	17	14	—	—	11
Other softwoods	27	—	29	21	25
Total softwoods	7	8	20	15	5
Red oak	—	21	—	—	20
White oak	—	44	—	—	57
Yellow birch	12	15	17	9	8
Paper birch	18	14	29	15	10
Sugar maple	11	9	12	9	6
Soft maples	14	13	19	17	9
Beech	15	13	18	14	9
Ash	22	21	30	24	12
Aspen	22	26	—	—	17
Other hardwoods	18	11	36	20	15
Total hardwoods	6	4	6	5	3
All species	3	3	3	4	2

Table 50. — *Volume of sawtimber on commercial forest land in the Northern geographic unit, in Vermont, by species and diameter classes, 1966*

(In millions of board feet) ¹

Species	Diameter class (inches at breast height)							
	All classes	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 28.9	29.0 and larger
White and red pines								
Spruces	268.3	42.2	41.4	37.6	24.3	22.6	96.6	3.6
Balsam fir	542.8	177.3	129.0	120.0	59.9	28.5	28.1	—
Hemlock	263.8	144.5	72.9	37.2	6.3	2.9	—	—
Other softwoods	289.4	80.4	62.7	50.5	45.4	27.3	23.1	—
	44.5	25.4	10.2	5.5	3.4	—	—	—
Total softwoods	1,408.8	469.8	316.2	250.8	139.3	81.3	147.8	3.6
Red oak	—	—	—	—	—	—	—	—
White oak	—	—	—	—	—	—	—	—
Yellow birch	308.8	—	55.2	83.6	62.1	31.7	66.4	9.8
Paper birch	57.2	—	30.0	18.0	6.7	2.5	—	—
Sugar maple	589.4	—	152.3	135.0	112.1	65.6	115.2	9.2
Soft maples	130.9	—	41.8	36.2	25.5	16.0	11.4	—
Beech	213.0	—	45.7	70.5	48.0	24.5	24.3	—
Ash	53.9	—	24.3	8.9	14.3	2.0	2.8	1.6
Aspen	41.1	—	12.6	24.6	3.9	—	—	—
Other hardwoods	86.5	—	23.7	16.2	11.0	10.3	25.3	—
Total hardwoods	1,480.8	—	385.6	393.0	283.6	152.6	245.4	20.6
All species	2,889.6	469.8	701.8	643.8	422.9	233.9	393.2	24.2

¹ International 1/4-inch rule.

Table 51. — *Volume of sawtimber on commercial forest land in the Southern geographic unit, in Vermont, by species and diameter classes, 1966*

(In millions of board feet)¹

Species	Diameter class (inches at breast height)							
	All classes	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-28.9	29.0 and larger
White and red pines	379.5	77.1	75.5	91.8	47.9	30.8	55.9	0.5
Spruces ²	358.7	98.2	94.9	71.1	41.2	22.9	30.4	—
Balsam fir	—	—	—	—	—	—	—	—
Hemlock	349.5	105.2	81.4	64.7	44.8	34.1	19.3	—
Other softwoods	—	—	—	—	—	—	—	—
Total softwoods	1,087.7	280.5	251.8	227.6	133.9	87.8	105.6	.5
Red oak	183.6	—	41.3	52.2	33.8	31.6	24.7	—
White oak	48.3	—	13.7	10.7	4.2	9.2	10.5	—
Yellow birch	175.7	—	62.9	33.7	28.2	21.3	26.1	3.5
Paper birch	160.2	—	56.0	32.5	30.9	17.9	20.7	2.2
Sugar Maple	587.0	—	162.1	139.8	83.0	83.2	107.7	11.2
Soft maples	226.6	—	81.5	68.8	35.2	21.0	20.1	—
Beech	240.3	—	58.4	59.1	39.3	36.2	47.3	—
Ash	153.4	—	46.9	45.9	14.3	20.9	23.1	2.3
Aspen	52.2	—	18.8	13.1	11.7	3.3	5.3	—
Other hardwoods	146.9	—	47.7	32.7	19.5	16.2	23.8	7.0
Total hardwoods	1,974.2	—	589.3	488.5	300.1	260.8	309.3	26.2
All species	3,061.9	280.5	841.1	716.1	434.0	348.6	414.9	26.7

¹ International 1/4-inch rule.

² Includes 20.1 million board feet of balsam fir and a negligible amount of other softwoods.

Table 52. — *Volume of sawtimber on commercial forest land in the National forest geographic units, in Vermont, by species and diameter classes, 1966*

(In millions of board feet) ¹

Species	Diameter class (inches at breast height)									
	All classes	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 28.9	29.0 and larger		
White and red pines	—	—	—	—	—	—	—	—		
Spruces ²	46.7	12.5	9.0	11.5	7.0	1.4	5.3	—		
Balsam fir	—	—	—	—	—	—	—	—		
Hemlock	—	—	—	—	—	—	—	—		
Other softwoods	25.0	5.6	5.7	3.5	4.0	2.2	4.0	—		
Total softwoods	71.7	18.1	14.7	15.0	11.0	3.6	9.3	—		
Red oak	—	—	—	—	—	—	—	—		
White oak	—	—	—	—	—	—	—	—		
Yellow birch	80.9	—	16.9	10.7	22.7	14.0	16.6	—		
Paper birch	14.0	—	6.4	2.7	1.3	2.6	1.0	—		
Sugar maple	182.0	—	44.4	54.3	39.2	14.7	27.2	2.2		
Soft maples	27.0	—	11.8	4.3	2.7	1.8	5.6	.8		
Beech	49.8	—	11.4	15.3	12.2	5.3	5.6	—		
Ash	32.3	—	6.0	13.1	7.1	3.3	2.8	—		
Aspen	—	—	—	—	—	—	—	—		
Other hardwoods	16.7	—	4.0	5.5	3.3	1.4	2.5	—		
Total hardwoods	402.7	—	100.9	105.9	88.5	43.1	61.3	3.0		
All species	474.4	18.1	115.6	120.9	99.5	46.7	70.6	3.0		

¹ International 1/4-inch rule.

² Includes a negligible amount of balsam fir.

Table 53. — *Volume of sawtimber on commercial forest land in the State forests geographic unit, in Vermont, by species and diameter classes, 1966*

(In millions of board feet) ¹

Species	Diameter class (inches at breast height)									
	All classes	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 28.9	29.0 and larger		
White and red pines	—	—	—	—	—	—	—	—		
Spruces ²	32.0	7.3	9.7	7.4	4.2	1.9	1.5	—		
Balsam fir	—	—	—	—	—	—	—	—		
Hemlock	—	—	—	—	—	—	—	—		
Other softwoods	26.4	5.7	6.0	5.4	3.6	2.0	3.4	0.3		
Total softwoods	58.4	13.0	15.7	12.8	7.8	3.9	4.9	.3		
Red oak	—	—	—	—	—	—	—	—		
White oak	—	—	—	—	—	—	—	—		
Yellow birch	31.8	—	8.3	7.1	5.1	4.6	6.4	.3		
Paper birch	7.1	—	3.9	1.8	1.0	.2	.2	—		
Sugar maple	41.1	—	10.1	9.0	9.5	4.3	8.2	—		
Soft maples	8.2	—	3.3	2.3	1.3	.9	.4	—		
Beech	15.7	—	4.8	4.4	3.3	2.0	1.2	—		
Ash	6.6	—	2.3	1.1	.8	1.3	1.1	—		
Aspen	—	—	—	—	—	—	—	—		
Other hardwoods	5.5	—	1.2	1.9	1.1	.7	.6	—		
Total hardwoods	116.0	—	33.9	27.6	22.1	14.0	18.1	.3		
All species	174.4	13.0	49.6	40.4	29.9	17.9	23.0	.6		

¹ International 1/4-inch rule.

² Includes a negligible amount of balsam fir.

Table 54. — *Sampling errors for sawtimber on commercial forest land, in Vermont, by species and geographic unit, 1966*

(In percent)

Species	Northern	Southern	National forest	State forests	Total
White and red pines	30	18	—	—	16
Spruces	16	24	29	18	13
Balsam fir	18	—	—	—	17
Hemlock	20	17	—	—	12
Other softwoods	33	—	43	19	31
Total softwoods	8	10	25	14	6
Red oak	—	28	—	—	26
White oak	—	50	—	—	69
Yellow birch	16	18	21	10	10
Paper birch	24	25	32	20	17
Sugar maple	13	11	12	12	7
Soft maples	18	16	23	22	11
Beech	17	16	18	17	10
Ash	31	37	29	25	20
Aspen	32	35	—	—	23
Other hardwoods	22	19	39	20	20
Total hardwoods	8	6	6	7	4
All species	3	3	4	6	2

Table 55. — *Volume of sawtimber on commercial forest land in the Northern geographic unit, in Vermont, by species and quality classes, 1966*

(In millions of board feet) ¹

Species	Standard-lumber logs				Other ²
	All classes	Grade 1	Grade 2	Grade 3	
Softwoods:					
White and red pines	268.3	11.1	63.5	127.3	66.4
Other softwoods ³	1,140.5	—	—	—	—
Total	1,408.8	11.1	63.5	127.3	66.4
Hardwoods:					
Red oak	—	—	—	—	—
White oak	—	—	—	—	—
Yellow birch	308.8	57.5	114.7	120.8	15.8
Paper birch	57.2	4.8	24.3	24.0	4.1
Sugar maple	589.4	116.3	175.9	235.5	61.7
Soft maples	130.9	8.6	37.7	64.3	20.3
Beech	213.0	10.5	65.9	114.9	21.7
Ash	53.9	15.0	15.6	16.2	7.1
Other hardwoods	127.6	20.5	32.1	58.4	16.6
Total	1,480.8	233.2	466.2	634.1	147.3
All species	2,889.6	244.3	529.7	761.4	—

¹ International 1/4-inch rule.

² For white and red pines "Other" is Grade 4, for hardwoods "Other" is Tie-and-Timber Log Grade. For a discussion of log grades see the appendix.

³ Other softwoods were not graded.

Table 56. — *Volume of sawtimber on commercial forest land in the Southern geographic unit, in Vermont, by species and quality classes, 1966*

(In millions of board feet) ¹

Species	Standard-lumber logs				Other ²
	All classes	Grade 1	Grade 2	Grade 3	
Softwoods:					
White and red pines	379.3	5.9	28.1	206.5	139.0
Other softwoods ³	708.2	—	—	—	—
Total	1,087.7	5.9	28.1	206.5	139.0
Hardwoods:					
Red oak	183.6	31.9	55.7	76.2	19.8
White oak	48.3	12.2	12.6	17.5	6.0
Yellow birch	175.7	14.1	51.0	100.1	10.5
Paper birch	160.2	14.6	40.5	84.7	20.9
Sugar maple	587.0	67.6	162.8	292.4	64.2
Soft maples	226.6	9.5	70.0	107.4	39.7
Beech	240.3	6.7	51.3	159.7	22.6
Ash	153.4	32.2	45.7	49.1	26.4
Other hardwoods	199.1	14.7	39.3	112.9	32.2
Total	1,974.2	203.5	528.9	999.5	242.3
All species	3,061.9	209.4	557.0	1,206.0	—

¹ International 1/4-inch rule.

² For white and red pines "Other" is Grade 4, for hardwoods "Other" is Tie-and-Timber Log Grade. For a discussion of log grades see the appendix.

³ Other softwoods were not graded.

Table 57. — *Volume of sawtimber on commercial forest land in the National forest geographic unit, in Vermont, by species and quality classes, 1966*

(In millions of board feet) ¹

Species	Standard-lumber logs				Other ²
	All classes	Grade 1	Grade 2	Grade 3	
Softwoods:					
White and red pines	—	—	—	—	—
Other softwoods ³	71.7	—	—	—	—
Total	71.7	—	—	—	—
Hardwoods:					
Red oak	—	—	—	—	—
White oak	—	—	—	—	—
Yellow birch	80.9	11.9	24.3	40.6	4.1
Paper birch	14.0	.6	1.7	10.3	1.4
Sugar maple	182.0	16.4	45.4	100.5	19.7
Soft maples	27.0	.7	5.8	17.4	3.1
Beech	49.8	.4	6.8	38.3	4.3
Ash	32.3	10.1	8.9	10.2	3.1
Other hardwoods	16.7	1.0	2.8	11.1	1.8
Total	402.7	41.1	95.7	228.4	37.5
All species	474.4	41.1	95.7	228.4	—

¹ International 1/4-inch rule.

² For white and red pines "Other" is Grade 4, for hardwoods "Other" is Tie-and-Timber Log Grade. For a discussion of log grades see the appendix.

³ Other softwoods were not graded.

Table 58. — Volume of sawtimber on commercial forest land in the State forest geographic unit, in Vermont, by species and quality classes, 1966

(In millions of board feet) ¹

Species	Standard-lumber logs				Other ²
	All classes	Grade 1	Grade 2	Grade 3	
Softwoods:					
White and red pines	6.0	0.2	0.6	3.4	1.8
Other softwoods ³	52.4	—	—	—	—
Total	58.4	.2	.6	3.4	1.8
Hardwoods:					
Red oak	—	—	—	—	—
White oak	—	—	—	—	—
Yellow birch	31.8	5.7	10.9	13.5	1.7
Paper birch	7.1	.5	3.7	2.4	.5
Sugar maple	41.1	5.7	11.2	18.9	5.3
Soft maples	8.2	.4	2.1	4.2	1.5
Beech	15.7	1.1	4.2	9.0	1.4
Ash	6.6	1.7	2.1	1.8	1.0
Other hardwoods	5.5	.7	1.3	2.8	.7
Total	116.0	15.8	35.5	52.6	12.1
All species	174.4	16.0	36.1	56.0	—

¹ International 1/4-inch rule.

² For white and red pines "Other" is Grade 4, for hardwoods "Other" is Tie-and-Timber Log Grade. For a discussion of log grades see the appendix.

³ Other softwoods were not graded.

Table 59. — *Average net annual growth of growing stock on commercial forest land in Vermont, by species and geographic unit, 1948-1965*

(In thousands of cubic feet)

Species	Northern	Southern	National forest	State forests	Total
White pine	2,321	9,963	—	—	12,284
Spruce and fir	12,064	5,285	296	361	18,006
Other softwoods	6,343	1,975	252	440	9,010
Total softwoods	20,728	17,223	548	801	39,300
Oaks	—	2,554	—	—	2,554
Yellow birch	1,995	502	205	79	2,781
Sugar maple	12,533	4,023	1,215	432	18,203
Soft maples	2,319	1,478	166	62	4,025
Ash	1,004	980	88	32	2,104
Other hardwoods	7,625	5,603	563	242	14,033
Total hardwoods	25,476	15,140	2,237	847	43,700
All species	46,204	32,363	2,785	1,648	83,000
<i>Sampling errors, in percent</i>					
All species	37	34	26	**	25

** More than 100 percent.

Table 60. — *Average annual cut of growing stock on commercial forest land in Vermont, by species and geographic unit, 1948-1965*

(In thousands of cubic feet)

Species	Northern	Southern	National forest	State forests	Total
White pine	1,176	4,854	—	—	6,030
Spruce and fir	6,571	3,201	320	115	10,207
Hemlock and other softwoods	5,413	4,518	270	62	10,263
Total softwoods	13,160	12,573	590	177	26,500
Oaks	—	1,712	—	—	1,712
Yellow birch	3,242	5,314	361	98	9,015
Sugar maple	4,398	4,845	399	130	9,772
Soft maples	449	1,949	219	16	2,633
Beech	1,624	4,278	108	64	6,074
Ash	397	639	132	20	1,188
Other hardwoods	2,117	1,267	856	66	4,306
Total hardwoods	12,227	20,004	2,075	394	34,700
All species	25,387	32,577	2,665	571	61,200
<i>Sampling errors in percent</i>					
All species	30	30	*	*	30

* Based upon cutting reports; no sampling errors.

Table 61. — *Average net annual growth of saw timber on commercial forest land in Vermont, by species and geographic unit, 1948-1965*

(In thousands of board feet)

Species	Northern	Southern	National forest	State forests	Total
White pine	10,625	23,579	—	—	34,204
Spruce and fir	24,116	10,570	677	637	36,000
Other softwoods	10,902	8,854	512	1,128	21,396
Total softwoods	45,643	43,003	1,189	1,765	91,600
Oaks	—	7,700	—	—	7,700
Yellow birch	4,500	1,129	461	178	6,268
Sugar maple	24,578	10,803	2,600	924	38,905
Soft maples	4,934	4,523	413	154	10,024
Ash	2,070	3,726	413	96	6,305
Other hardwoods	7,554	5,547	557	240	13,898
Total hardwoods	43,636	33,428	4,444	1,592	83,100
All species	89,279	76,431	5,633	3,357	174,700
<i>Sampling errors in percent</i>					
All species	50	*	36	**	24

* 51 to 100 percent.

** More than 100 percent.

Table 62. — *Average annual cut of sawtimber on commercial forest land in Vermont, by species and geographic units, 1948-1965*

(In thousands of board feet)

Species	Northern	Southern	National forest	State forests	Total
White and red pine	6,035	27,055	—	—	33,090
Spruce and balsam fir	36,413	7,012	1,037	304	44,766
Hemlock and other softwoods	18,252	31,832	998	198	51,280
Total softwoods	60,700	65,899	2,035	502	129,136
Oaks	—	4,818	—	—	4,818
Yellow birch	11,113	19,662	1,383	307	32,465
Sugar maple	9,216	16,000	1,187	314	26,717
Soft maples	—	1,650	672	40	2,362
Beech	5,317	13,863	392	188	19,760
Ash	2,248	898	396	50	3,592
Other hardwoods	2,356	2,913	1,600	99	6,968
Total hardwoods	30,250	59,804	5,630	998	96,682
All species	90,950	125,703	7,665	1,500	225,818
<i>Sampling errors, in percent</i>					
All softwoods	31.2	39.4	*	*	25.4
All hardwoods	36.5	30.4	*	*	23.6
All species	23.9	23.5	*	*	16.9

* Based upon cutting report, no sampling errors.

Table 63. — *Area of Vermont, by land classes and counties, 1966*

County	Total area	Total land area ¹	Forest land area				Sampling error ³		
			Nonforest land area		Noncom- mercial ²			Commercial	
			M acres	M acres	M acres	Percent		M acres	Percent
Addison	523.5	502.4	231.1	5.2	266.1	53	3		
Bennington	430.7	430.1	61.1	3.6	365.4	85	2		
Caledonia	396.2	392.3	112.9	1.3	278.1	71	3		
Chittenden	393.0	340.5	143.2	.7	196.6	58	4		
Essex	429.4	424.3	31.2	1.5	391.6	92	1		
Franklin	450.6	421.7	207.9	1.8	212.0	50	6		
Grand Isle	121.0	49.3	49.3	—	—	—	—		
Lamoille	304.6	304.0	53.9	1.8	248.3	82	2		
Orange	442.9	441.6	119.2	.6	321.8	73	3		
Orleans	471.7	457.6	134.2	.8	322.6	70	3		
Rutland	600.9	594.6	156.5	4.8	433.3	73	2		
Washington	457.0	453.1	97.5	3.4	352.2	78	2		
Windham	509.4	507.5	81.9	.2	425.4	84	2		
Windsor	618.9	617.6	135.0	1.4	481.2	78	2		
All counties	6,149.8	5,936.6	1,614.9	27.1	4,294.6	72	1		

¹ Land area from 1964 Census of Agriculture, Volume 1. Total area less water areas of 40 acres or larger.² Includes nonproductive and productive-reserved forest land.³ In percent for commercial forest land, at the 68-percent probability level.

Table 64. — *Area of commercial forest land in Vermont, by ownership classes and counties, 1966*
(In thousands of acres)

County	Public ¹		Private		
	National forest	State forests	Other public	Farmer-owned ²	Other private
Addison	75.6	0.7	5.4	77.4	107.0
Bennington	58.2	1.4	9.6	49.4	246.8
Caledonia	—	14.1	2.1	140.8	121.1
Chittenden	—	8.3	5.5	79.2	103.6
Essex	—	5.0	.8	48.9	336.9
Franklin	—	—	1.1	128.9	82.0
Lamoille	—	6.5	7.4	68.9	165.5
Orange	—	1.7	5.8	139.7	174.6
Orleans	—	2.1	8.5	169.7	142.3
Rutland	48.9	8.2	12.4	145.4	218.4
Washington	3.3	21.8	6.5	87.5	233.1
Windham	14.4	1.5	6.3	76.8	326.4
Windsor	19.5	12.0	24.3	139.0	286.4
Total	219.9	83.3	95.7	1,351.6	2,544.1
					4,294.6

¹ From ownership records.

² Ratios for farmer-owned forest land by county were derived for each geographic unit from the 1964 Census of Agriculture.

Table 65. — *Area of commercial forest land in Vermont, by stand-size classes and counties, 1966*

(In thousands of acres)

County	Sawtimber stands	Poletimber stands	Sapling-and-seedling stands	Nonstocked areas	Total
Addison	118.3	94.0	53.8	—	266.1
Bennington	160.8	140.8	63.8	—	365.4
Caledonia	100.9	83.7	87.1	6.4	278.1
Chittenden	74.1	71.4	51.1	—	196.6
Essex	175.8	137.3	75.5	3.0	391.6
Franklin	59.5	51.5	91.3	9.7	212.0
Lamoille	108.1	84.9	52.3	3.0	248.3
Orange	125.6	100.6	89.5	6.1	321.8
Orleans	129.0	103.4	84.5	5.7	322.6
Rutland	183.4	161.4	88.5	—	433.3
Washington	149.8	117.7	79.9	4.8	352.2
Windham	177.7	167.8	79.9	—	425.4
Windsor	204.8	185.3	91.1	—	481.2
Total	1,767.8	1,499.8	988.3	38.7	4,294.6

Table 66. — *Area of commercial forest land in Vermont, by stocking percent classes of desirable trees and counties, 1966*

(In thousands of acres)

County	Desirable-tree stocking class			Total
	70 to 100 percent	40 to 70 percent	Under 40 percent	
Addison	0.4	9.9	255.8	266.1
Bennington	.6	12.8	352.0	365.4
Caledonia	8.0	50.2	219.9	278.1
Chittenden	.4	11.3	184.9	196.6
Essex	14.6	66.2	310.8	391.6
Franklin	4.3	40.5	167.2	212.0
Lamoille	9.1	42.8	196.4	248.3
Orange	9.5	55.7	256.6	321.8
Orleans	10.2	56.3	256.1	322.6
Rutland	.7	20.8	411.8	433.3
Washington	11.7	59.3	281.2	352.2
Windham	1.2	17.8	406.4	425.4
Windsor	1.8	22.0	457.4	481.2
Total	72.5	465.6	3,756.5	4,294.6

Table 67. — *Area of commercial forest land in Vermont, by forest-type groups and counties, 1966*
(In thousands of acres)

County	Forest-type group							Total
	White- red pine	Spruce- fir	Oak- pine	Oak- hickory	Elm-ash- red maple	Maple- beech- birch	Aspen- birch	
Addison	33.6	21.3	5.4	7.5	33.6	147.9	16.8	266.1
Bennington	50.2	26.5	6.9	11.3	50.9	198.2	21.4	365.4
Caledonia	37.8	77.9	.9	1.7	33.3	109.7	16.8	278.1
Chittenden	34.3	16.8	6.4	5.4	34.5	83.3	15.9	196.6
Essex	45.4	103.2	1.9	1.3	31.9	189.9	18.0	391.6
Franklin	34.5	63.1	.4	1.4	38.6	61.3	12.7	212.0
Lamoille	29.0	65.6	1.2	.7	22.2	117.9	11.7	248.3
Orange	43.2	87.6	1.4	1.6	36.8	135.2	16.0	321.8
Orleans	41.9	88.4	1.3	1.4	34.4	138.7	16.5	322.6
Rutland	63.2	35.5	12.4	12.4	65.3	215.9	28.6	433.3
Washington	40.8	91.1	1.9	1.2	32.9	167.5	16.8	352.2
Windham	68.3	31.8	9.8	13.7	66.8	208.7	26.3	425.4
Windsor	77.6	40.3	12.8	15.4	73.8	230.2	31.1	481.2
Total	599.8	749.1	62.7	75.0	555.0	2,004.4	248.6	4,294.6

Table 68. — *Volume of growing stock on commercial forest, land in Vermont, by stand-size classes and counties, 1966*

County	Sawtimber stands	Poletimber stands	Other stands	Total	Sampling error of total
<i>Millions of cubic feet</i>					<i>Percent</i>
Addison	132.2	84.8	16.0	233.0	5
Bennington	187.1	127.5	21.6	336.2	4
Caledonia	112.4	84.9	22.1	219.4	5
Chittenden	82.7	61.5	14.0	158.2	6
Essex	211.0	142.1	24.6	377.7	4
Franklin	60.3	48.3	18.0	126.6	7
Lamoille	131.1	87.8	15.6	234.5	5
Orange	140.7	98.0	23.3	262.0	5
Orleans	148.3	102.6	22.7	273.6	5
Rutland	212.2	144.8	26.1	383.1	4
Washington	178.1	119.2	23.3	320.6	4
Windham	214.8	149.5	26.4	390.7	4
Windsor	254.2	167.1	28.3	449.6	4
All counties	2,065.1	1,418.1	282.0	3,765.2	2

Table 69. — *Net cubic-foot volume on commercial forest land in Vermont, by tree classes and counties, 1966*

(In millions of cubic feet)

County	Sawtimber trees	Poletimber trees	Total growing stock	Rough and/or rotten trees	Total sound volume
Addison	113.1	119.9	233.0	34.4	267.4
Bennington	159.1	177.1	336.2	46.0	382.2
Caledonia	97.4	122.0	219.4	27.1	246.5
Chittenden	71.6	86.6	158.2	21.1	179.3
Essex	173.8	203.9	377.7	40.6	418.3
Franklin	53.8	72.8	126.6	16.9	143.5
Lamoille	108.3	126.2	234.5	25.1	259.6
Orange	116.7	145.3	262.0	30.7	292.7
Orleans	123.3	150.3	273.6	31.1	304.7
Rutland	181.0	202.1	383.1	51.2	434.3
Washington	146.7	173.9	320.6	36.0	356.6
Windham	181.0	209.7	390.7	49.9	440.6
Windsor	212.2	237.4	449.6	56.9	506.5
Total	1,738.0	2,027.2	3,765.2	467.0	4,232.2

Table 70. — *Volume of sawtimber on commercial forest land in Vermont, by stand-size classes and counties, 1966*

County	Sawtimber stands	Poletimber stands	Other stands	Total	Sampling error of total
<i>Millions of board feet</i>				<i>Percent</i>	
Addison	345.9	86.2	21.1	453.2	6
Bennington	472.3	127.2	27.7	627.2	5
Caledonia	261.3	81.0	16.6	358.9	7
Chittenden	202.2	58.0	16.3	276.5	7
Essex	486.6	129.0	21.0	636.6	6
Franklin	136.7	45.9	12.8	195.4	9
Lamoille	304.8	80.3	13.4	398.5	7
Orange	319.1	88.4	18.0	425.5	7
Orleans	338.8	93.3	17.9	450.0	7
Rutland	531.9	144.5	33.1	709.5	6
Washington	414.7	108.9	19.6	543.2	6
Windham	523.7	145.3	31.8	700.8	6
Windsor	627.5	164.0	33.5	825.0	6
All counties	4,965.5	1,352.0	282.8	6,600.3	2

Table 71. — *Volume of growing stock on commercial forest land in Vermont, by species group and counties, 1966*

(In millions of cubic feet)

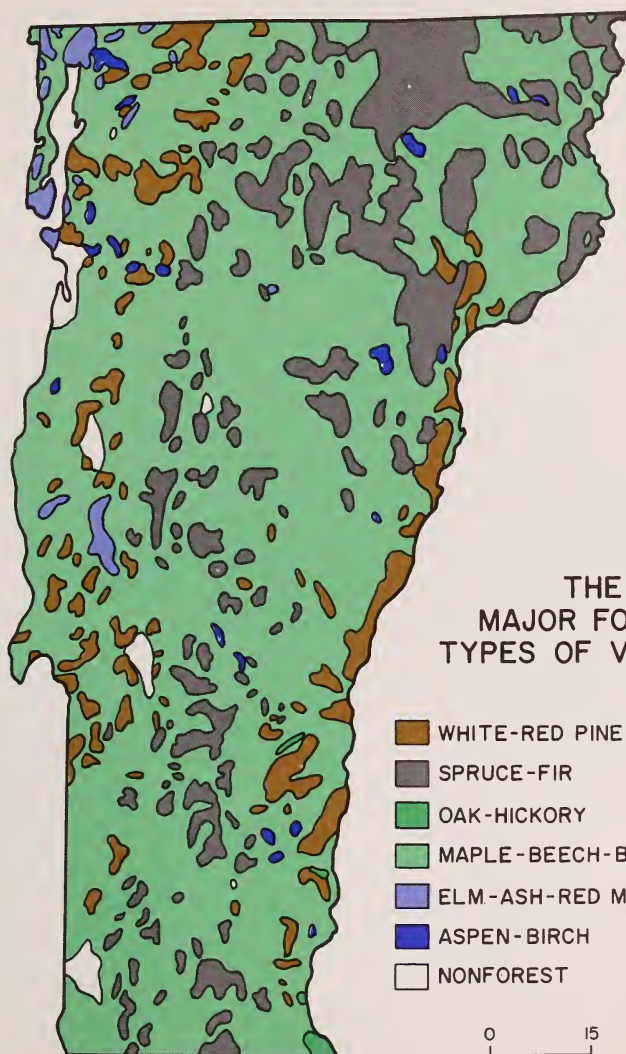
Counties	All species	Softwoods	Hardwoods
Addison	233.0	63.6	169.4
Bennington	336.2	92.8	243.4
Caledonia	219.4	106.7	112.7
Chittenden	158.2	49.7	108.5
Essex	377.7	177.0	200.7
Franklin	126.6	63.0	63.6
Lamoille	234.5	109.4	125.1
Orange	262.0	120.5	141.5
Orleans	273.6	128.3	145.3
Rutland	383.1	109.2	273.9
Washington	320.6	144.2	176.4
Windham	390.7	116.5	274.2
Windsor	449.6	138.8	310.8
Total	3,765.2	1,419.7	2,345.5

Table 72. — *Volume of sawtimber on commercial forest land in Vermont, by species group and counties, 1966*

(In millions of board feet)

Counties	All species	Softwoods	Hardwoods
Addison	453.2	127.4	325.8
Bennington	627.2	190.5	436.7
Caledonia	358.9	178.6	180.3
Chittenden	276.5	100.3	176.2
Essex	636.6	309.8	326.8
Franklin	195.4	98.5	96.9
Lamoille	398.5	193.1	205.4
Orange	425.5	200.2	225.3
Orleans	450.0	217.0	233.0
Rutland	709.5	223.9	485.6
Washington	543.2	252.0	291.2
Windham	700.8	242.8	458.0
Windsor	825.0	292.5	532.5
Total	6,600.3	2,626.5	3,973.7





THE
MAJOR FOREST
TYPES OF VERMONT

- WHITE-RED PINE
- SPRUCE-FIR
- OAK-HICKORY
- MAPLE-BEECH-BIRCH
- ELM-ASH-RED MAPLE
- ASPEN-BIRCH
- NONFOREST

0 15
MILES



